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The maps, unfinished work and all effects of the South Pennsylvania Ry., projected and partly constructed from Harrisburg to Pittsburg, Pa., 10 years ago, have been purchased by the Cumberland Valley Ry. Co., a corporation controlled by the Pennsylvania R. R. Co. Active work was commenced upon this projected parallel to the main line of the Pennsylvania R. R. in 1883, by the Vanderbilt and Philadelphia & Reading interests, and was continued until 1885. The incentive was an alleged encroachment of the Pennsylvania company upon the New England territory of the Vanderbilt system, and the encouragement of the rival West Shore project. In retaliation, the Beech Creek Ry. into the bituminous coal territory of the Pennsylvania system, and the South Pennsylvania Ry. were started and construction was pushed upon both. In 1885 the contending corporations reached an arrangement whereby the Vanderbilts were to take the West Shore road and the Pennsylvania was to lease the Beech Creek and buy the South Pennsylvania for $4,500,000. But the Pennsylvania courts and the constitution of that state stood in the way and the deal was never consummated. At last, however, in spite of court and constitution, the Pennsylvania R. R. Co. practically owns all that is left of its one-time rival.

The Pennsylvania R. R. Co., according to Philadelphia press items, has placed an additional order of 9,000 tons of steel rails at $24 per ton, making 56,000 tons recently ordered. These rails are intended for use on the new Delaware bridge and its approaches and connecting lines in New Jersey, and for renewals and new track on the main line. The same journals state that the receivers of the Philadelphia & Reading R. R. Co. are authorized by the U. S. Circuit Court to buy 1,000 coal cars from the Pullman Co. for the sum of $480,500. The receivers are to pay 10% in cash and the balance in 60 monthly notes. They are also authorized to purchase from Wm. Cramp & Sons two steam tugs and six barges for $252,000, paying $52,000 cash and the balance in monthly notes.

A car coupler suit has been filed in the U. S. Circuit Court by the McConway & Torley Co., of Pittsburg, Pa., against Shickle, Harrison & Howard, of St. Louis, Mo. The former company is the sole owner of the Janney coupler patents, and claims that the latter company is infringing these patents. It has, therefore, applied for an injunction and an accounting.

Electric towing on the Erie Canal is to be tried under a contract recently made between Mr. E. G. Spilsbury, M. Am. Soc. C. E., Managing Director of the Trenton Iron Co., and Mr. Frank W. Hawley, Vice-President of the Cataract General Construction Co. The experimental line will be four miles in length, and work will soon be begun. Along each bank of the canal will be erected a pole line, the poles being made of hollow steel and set in cement, extending 16 ft. above the ground and outside of the towpath. The poles will carry a 1¼-in. steel cable, and 14 ins. below this cable will be placed a 1-in. cable. From the top cable is suspended a traveler or car, with a wheel operated by a Tesla electric motor. The current enters the motor from the upper cable and is discharged through the lower one. A motorman operates the traveler in the same manner as in electric cars. This method of application of power is said to be in operation in the logging district of North Carolina, and is described and illustrated in a paper by Mr. R. Lamb, published in the Transactions of the American Society of Civil Engineers, July, 1894. The Cataract General Electric Co. was authorized under a recent act of the legislature to equip the canals of the state with such a system of canal-boat propulsion, and supply to boat owners such electric propulsion at a rate not to exceed $30 per HP. per annum.

Electric motors for pumping oil wells are proposed to be used instead of steam engines in West Virginia. A hindrance to the development of the West Virginia oil territory has heretofore been the necessity of hauling steam boilers to the well sites and furnishing them with water and fuel. By placing an electric motor at each well, supplied with current from a central electric plant, it is believed that the cost of putting down a well will be reduced nearly one-half. It is proposed to put up a plant in the Sisterville district of West Virginia that will furnish power for the operation of two hundred wells.

The operation of the Burlington branch of the Pennsylvania R. R. by electricity was commenced July 23, and has proved successful. The line is six miles long, extending from Mount Holly, N. J., to Burlington, and is said to have been a non-paying line when operated by steam. The Pennsylvania R. R. therefore decided to adopt electric traction, using the overhead wire system, and the work has been done by the Westinghouse Electric & Mfg. Co., of Pittsburg, Pa.

The General Term of the Supreme Court has given a decision in favor of the Nassau Electric Ry. Co., of Brooklyn, N. Y., in the suit brought by the Union Ry. Co. on the ground that the franchise had been granted free to the company, and that there was a corrupt agreement between the common council and the company. The case will be carried to the Court of Appeals.

Electric power transmission for a distance of 105 miles is proposed by the Kern River & Los Angeles Electric Power Co., of Los Angeles, Cal. Mr. H. Hawgood, M. Inst. C. E., is the Consulting Engineer, and he now has a party in the field selecting the most feasible route for the transmission line between Kern River and Los Angeles. The scheme contemplates the development and transmission of from 10,000 to 40,000 HP. The plant recently installed at Folsom, Cal., generates about 6,200 HP., and transmits 5,000 HP. to Sacramento, a distance of 19 miles, at a tension of 11,000 volts.

In an underground conduit system for electric railways, of which the Westinghouse Electric & Mfg. Co. has secured control, the conductor is laid in a closed conduit, with contact pieces extending to the surface at intervals of about 15 ft., and under the car are rods or slats over 15 ft. long, so that there is always contact with at least one of the knobs. The current passes through one contact piece and bar to the motor, and thence through the other bar and contact piece to the return conductor. The system has been in operation at Washington, D. C., for about a year, and is in use at the company's new works at East Pittsburg, Pa.

The most serious railway accident of the week was a collision on the Pennsylvania R. R. at Landisville, Pa., July 24. A heavy eastbound freight train got beyond control and ran into an open switch, colliding with a train standing on the side track. One man was killed.

A train loaded with pilgrims left the rails near St. Brieuc, Cotes du Nord, France, on July 26, and 12 persons were killed and 25 injured.

A troop train of 23 cars, carrying soldiers returning from the war in China, was derailed on a sea wall between Kobe and Osaka, Japan, and the engine and 11 cars went into the bay. About 140 men were killed. The line follows the coast, and it is said that a storm prevailed at the time and that a heavy sea swept over the railway and caused the derailment.

The steel framework of a large shed which was being erected over a pier on the North River, New York city, for the Fall River Line, was blown down during a heavy storm July 29, owing to lack of longitudinal bracing. The shed was 680 ft. long, and was nearly completed and ready for the roof.

The steamer "Aurania," of the Cunard Line, arrived at New York, July 30, two days late, having been delayed 35 hours at sea by a defect in a bend of the main steam pipe. The pipe is of copper, 24 ins. in diameter, and the fracture occurred on the outside of the bend. The section of pipe, about 6 ft. long, was taken down and a copper plate formed to shape was riveted inside the pipe to patch the fracture.

A new air-brake for electric cars is being brought out by two Chicago inventors, Messrs. Frank W. Merritt and Arthur R. Roe. The principal novelty is the use of a reciprocating electric motor to compress the air, the motor taking its current from the line wire. An automatic cut-out is provided, so that the pump works only when the air pressure is reduced. The reservoir contains air enough to make several applications of the brake. The brake is applied by a three-way cock, and it is probable that the inventors will need to develop this part of the apparatus somewhat before they will attain success.

The engineering force of the Massachusetts Metropolitan Water Supply Board is now being organized, the principal engineering positions having already been filled, as stated in our personal column this week, while altogether quite a force has been engaged. Mr. F. P. Stearns, M. Am. Soc. C. E., is Chief Engineer, and at present has his headquarters at the State House, Boston. The preliminary work is being pushed with a view of letting about two miles of tunnel work this fall, if possible, and the remainder of the aqueduct next spring. An outline of these proposed new supply works for "Greater Boston" was given in our issue of March 7, 1895.

An object lesson in water filtration is proposed at Pittsburg, Pa., by the Citizens' League. A small sand filter about 6 ft. in diameter is to be put in operation where the public can examine it, with an attendant to explain its workings. Allegheny River water will be filtered.

The Nicaragua Canal Commissioners, Col. William Ludlow, Civil Engineer M. T. Endicott, U. S. N., and Mr. Alfred Noble, M. Am. Soc. C. E., are now at work, in the Army Building in New York city upon the preparation of their report to the President, due on Nov. 1. Meanwhile, the Nicaragua Canal Construction Co. is caring for the plant and doing some minor work upon the canal; it is waiting for the Commission's report before taking any decided steps in any direction.

The Wright Irrigation Law of California has been declared unconstitutional by Judge Ross in the U. S. Circuit Court at Los Angeles. Under this law a number of irrigation districts have been organized, including about 1,500,000 acres of land. These districts, under the law, had power to adopt and carry out plans for irrigation works and to issue bonds for the same. The interest and principal of these bonds were payable from taxes levied on the land within the district. A total of about $15,500,000 of bonds have been voted by the several districts, of which some $8,300,000 have been sold. The case will be carried to the U. S. Supreme Court.

A plan for the reclamation of some six square miles of the Newark meadows has been presented to the Street Committee of the Street and Water Board of Newark, N. J., by Mr. Rudolph Hering, M. Am. Soc. C. E. The reclaimed land would be thoroughly underdrained and provided with sewers, and a pumping plant would be installed to lift the drainage and discharge it into Newark Bay.

The statement concerning the experience with the temporary boring-frame, erected on the Diamond Shoal, off Cape Hatteras, as published in our issue of July 18, taken from a newspaper account, is corrected by a late official announcement of the Lighthouse Board. The structure erected upon the outer shoal one year ago was really a boring-frame by which the nature of the foundation was determined. This foundation, as anticipated, was found to be sand to an indefinite depth. After the borings were completed the frame was left standing because it was thought that observations upon the effect of the seas upon such a structure would be useful in determining the power and direction of the waves. The Lighthouse Board was kept fully informed of the condition of the frame by the keeper at Cape Hatteras and by passing steamers. While the frame has been damaged, it is still far from being entirely destroyed, though only temporary in character and subjected to some violent storms and hurricanes during the period since it was placed, now somewhat over one year. The experience is, in fact, very encouraging for the founding of a permanent light on these shoals. There has been no scour or shifting of the sand about the frame, and no settlement. Plans for the permanent structure are now being prepared by the Lighthouse Board.

Reheating molten steel in the ladle by an electric current was tried at the Homestead Steel Works on July 17, according to newspaper reports, with remarkable success. Details are wanting as to the manner in which the resistance to develop the heat was provided.

LOUISVILLE, NEW ALBANY & CHICAGO RY. CO.'S LAFAYETTE, IND., SHOPS.

(With Inset.)

The new general shop buildings of the Louisville, New Albany & Chicago Ry. at Lafayette, Ind., afford a good example of the most modern practice in American railway shop construction. These shops have only recently been completed, and besides their careful general design and construction to suit the needs of the work to be done by them, they contain a number of novel features in their structural details and general arrangement. In the accompanying cuts and on our inset sheet this week we illustrate some of the more important features of this work.

General Plan.—Fig. 1 is a general plan of the shops and yards as constructed, the main line coming in from the northeast, and forming the outer track of the yard-track system. The shop-track system is separated from the yard-track system, and located upon somewhat higher ground, as will be noticed from the figures showing the surface levels. The location of the shop buildings in relation to the shop-track system and yards is clearly shown by the plan. The main structures comprised by the shop are: (1) office building and store room; (2) engine house; (3) a combination building, containing a machine shop, boiler shop and blacksmith shop; (4) car shop with mill room; (5) paint shop; (6) power house; (7) oil house, and (8) coal chute, cinder pit and transfer and turntables.

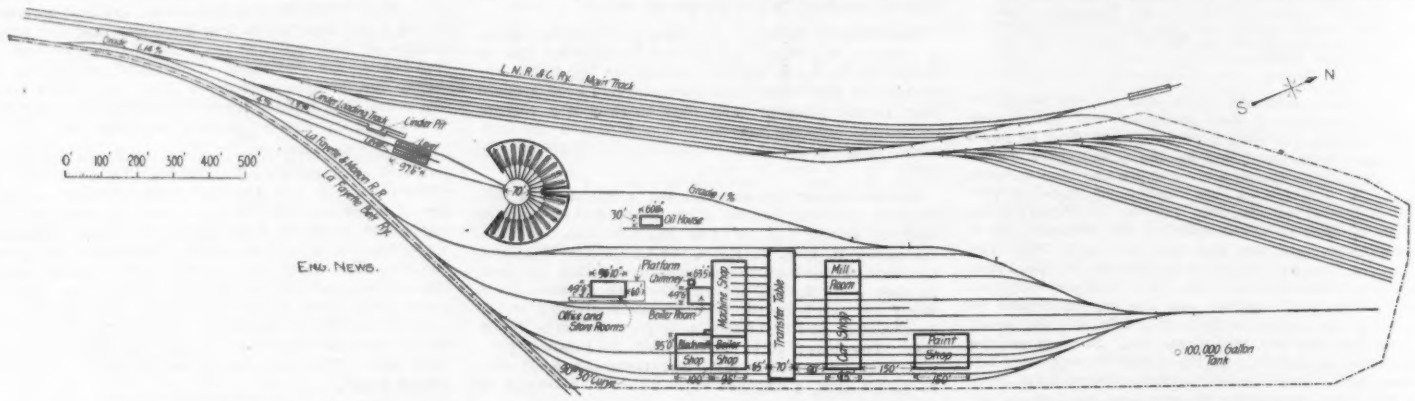


FIG. 1. GENERAL PLAN OF YARDS AND SHOPS FOR LOUISVILLE, NEW ALBANY & CHICAGO RY., AT LAFAYETTE, IND.
Ferd. Hall, Chicago, Ill., Chief Engineer.

The main features of the construction of each of these buildings will be taken up in the order in which they are named.

At the outset it should be stated that as far as possible a uniform style of construction was adopted throughout. Except where otherwise stated, the excavation for foundations was about 4 ft. deep, and the foundations consist of a concrete footing supporting a rubble masonry wall with a cut stone water-table on top. Where columns instead of walls are to be carried, requiring isolated pier foundations, the construction is exactly the same, but these occur only in one building in any very great number. The walls above the water-table are of brick laid in lime mortar, and the roof trusses are carried directly on them, bearing stones being set into the brick masonry at the proper points. With the exception of the office and engine house, steel or iron roof trusses are used throughout, varying, of course, in span, and to some extent in design, for the smaller buildings. For the larger buildings—viz., the paint, car and machine shops—the roof trusses are nearly identical in all except minor details.

Except where otherwise stated, yellow pine purlins bolted to brackets on the rafters and covered with 2 × 8-in. tongued and grooved roofing boards are used. Generally the covering is sheet roofing steel, but there are one or two exceptions, which will be noted in the proper place.

The skylights and ventilators are uniform for all buildings. American wire glass (Eng. News, April 5, 1894) is used for the skylights, and a special form of cast iron ventilator, 20 ins. in diameter, and provided with a damper regulated from below by a cord, is also used.

The specifications required the foundation walls to be of first-class rubble masonry, laid in Louisville cement mortar, and the main walls to be the best quality of hard-burned brick laid in lime mortar. The natural cement concrete was required to consist of two parts broken stone to one part of two to one Louisville cement mortar, and the Portland cement concrete to consist of one part cement, two parts sand and four parts broken stone. All the stone for concrete, and also for all the stone masonry, was required to be Indiana oolitic limestone taken from the railway company's quarries. The provisions of the specifications for laying the masonry conformed to the ordinary stipulations for first-class work of this character, and need not be further described.

In the matter of minor details common to all buildings may be mentioned the quarry-face stone window caps, the 10-in. steel I-beam lintels for the large doors, galvanized iron rain-water gutters and conductors to the sewers.

Office Building.—This building is 96 ft. 10 ins. long, and 49 ft. 6 ins. wide, the front 48 ft. 5 ins. of its length being two stories high, and the rear 1½ stories high. The first floor of the front part and the entire rear part are used as storerooms, and the second story of the front part is divided into a Master Mechanic's office, Master Car Builder's office, drawing room, clerks' room and vaults. The foundations and walls are of the adopted style all ready described, and the roof and interior work need no particular mention.

Engine House.—This is built in two sections of 10 stalls each. The two sections are separated by two fire walls, between which a track extends entirely through the building. There are nine pits in each section. The foundations, walls, etc., are of rubble stone and brick masonry of the same style of construction as described for the office building. The small plan in Fig. 1 gives a pretty clear idea of the arrangement of the stalls, pits, etc. Fig. 2 shows an enlarged detail of the catch basin and pit construction. These catch basins are located at the ends of the pits nearest the turntable, and the 12-in. sewer runs in a circle, connecting each pit with the general sewerage system of the yards. The roof consists of timber rafters, 10 × 14 ins., carried by the brick wall, an intermediate row of wooden posts between the pits, and an outside row of cast iron posts, as shown by the plan, Fig. 1. On the rafters are placed timber purlins, 6 × 14 ins., to which is fastened the regular 2 × 8-in. roofing, with a four-ply gravel covering. The roof is provided with the necessary smoke jacks, ventilators, etc., and the side walls with convenient windows and doors. The turntable at the entrance is 70 ft. long, and is carried on rubble stone masonry and concrete foundations.

Machine Shop.—The building containing the machine shop and boiler and blacksmith shops is shown in general plan in Fig. 1, and Fig. 3 shows part side and end elevations in somewhat more detail. These elevations show the exterior appearance of the other buildings, as well as the machine shop, all being built after the same style. The foundation walls, outside walls, etc., are of the regular form of construction just described. The clear height of the roof trusses above the top of rail is 28 ft. for the machine shop and 19 ft. for the boiler and blacksmith shops. The regular roofing of 2 × 8-in. tongued and grooved white pine boards, with the No. 22 sheet roofing steel covering, is used for the machine and boiler shops, but a five-ply felt and ¼-in. actinolite cement is used for the blacksmith shop.

One of the roof trusses for the machine shop is shown by Fig. 4, and, with the exception of minor details, the trusses for the paint and car shops are exactly the same. The material is medium steel, with an ultimate strength of from 60,000 lbs. to 68,000 lbs., an elastic limit one-half the ultimate strength, an elongation of 20% in 8 ins., and a reduction of area at fracture of 40%. All the iron work was painted with one coat of boiled linseed oil and one coat of mineral paint.

The machine shop has eight pits for locomotives, and receives all power for its machinery, as do the boiler and blacksmith shops, from a single power plant located at the south side of the building. This plant comprises two 250-HP. Corliss engines, one to operate the wood-working machinery and one to operate the iron-working machinery, and a 100-HP. engine to operate an electric generator. A small engine is also located in the mill room of the car shop and takes its steam from the main boiler plant. There are three 150-HP. boilers. The electric generator supplies current for lights and to operate the transfer table. All the shafting in the machine shop is overhead, but in the mill room of the car shop it is placed under the floor.

Fig. 5 shows the construction of the 130-ft. chimney for the power plant. In constructing this chimney the ground was excavated to firm material and a 26 × 26 × 2-ft. concrete footing laid. On the top of this footing was placed a grillage of 12-in. I-beams laid 16 ins. apart in two courses at right angles to each other, and filled with concrete. On this grillage came two courses 2½ ft. thick and one course 2 ft. thick of first-class masonry, capped by a water-table filled in with brick. The construction of the chimney proper is clearly explained by the illustration, Fig. 5.

Car Shop.—This building is 95 × 300 ft., with 98 ft. at one end separated from the main shop by a fire wall and used as a mill room. The foundations of the mill room are sunk about 9½ ft. below the floor line, so as to give a cellar, and consist of isolated masonry piers carrying posts which support the floor girders, but the foundations for the car shop and the walls for the whole building are of the uniform style of construction already described. The roof trusses, purlins, covering, ventilators, skylights, etc., are the same as for the machine shop. The clear height from top of rail to bottom chord of roof truss is 19 ft.

Paint Shop.—This building is 150 × 95 ft., and is built exactly like the others in all particulars of foundations, walls and roof, but has a vitrified paving brick floor between the three tracks en-

tering it. This floor consists of one course of paving brick laid in sand on gravel, and crowned so as to drain into five 6-in. sewers running transversely across the building. Oak curbs, 3 × 10 ins., separate the paving from the track.

Oil House.—This is a good example of the best modern practice in constructing oil storage and supply houses for railways. It is fireproof throughout, having iron shutters to the windows, rolling iron shutters closing the openings between rooms, concrete and iron or brick arch floors, etc. The general arrangement and construction of the building is shown by the plan and sections, Fig. 6. These drawings, besides showing the construction of the oil house, also explain in a large measure the regular style of foundation and wall construction, window caps, lintels, etc., used in most of the other buildings. The roof is covered with slate, but otherwise corresponds to the regular form of roof construction described above. The floor construction, arrangement of the tanks and construction of their supports, and other details are so clearly shown by the drawings as to need no description.

Smaller Structures.—Fig. 7 is a cross-section of the cinder pit, whose location is shown by Fig. 1. It is 50 ft. long and built of masonry. One rail of the track rests on one side wall, and the other is carried by a 15-in. I-beam supported by cast iron posts resting on masonry piers. Details of the cast iron posts, rail fastenings, etc., are shown by the drawings.

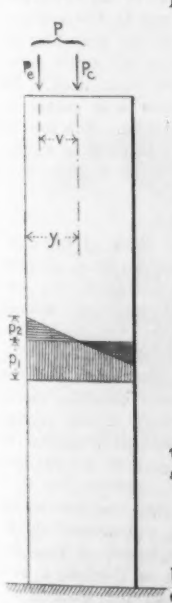
The transfer and turntables are of ordinary design, and call for no especial mention. As has already been stated, the transfer table is operated by electric power, and the foundations for both tables are concrete and rubble stone masonry. Besides these structures there are a 1,000-gallon water tank, coal chute and other necessary structures.

For the matter from which our illustrations have been prepared we are indebted to Mr. Ferd. Hall, Chief Engineer, Louisville, New Albany & Chicago Ry., under whose direction the work was planned and carried out.

A SIMPLE FORMULA FOR SHORT COLUMNS WITH ECCENTRIC LOADS.

By J. B. Johnson,* M. Am. Soc. C. E.

For short columns, such as architects have to use in iron and steel building construction, where $\frac{l}{r}$ seldom exceeds 50 or 60, the weakening effect of the length is so slight that it may well be neglected. We must, however, provide for eccentric loads. For these conditions the following simple formula may be derived:



Let P_c = concentric load;
P_e = eccentric load;
$P = P_c + P_e$;
k = eccentricity of eccentric load in terms of the half-width of column = $\frac{v}{y_1}$;
A = area of column;
r = radius of gyration of column in the plane of the eccentric load;
$M = p_e v$ = moment of eccentric load;
p = working maximum stress on the extreme fibers of the column on the side of the eccentric load.

Then we have a uniformly distributed stress over the entire section of the column,

$$p_1 = \frac{P}{A} = \frac{P_e + P_c}{A} \qquad (1)$$

In addition, we have a bending moment on the column of

$$M = P_e v = \frac{p_2 I}{y_1} = \frac{p_2 A r^2}{y_1} \qquad (2)$$

whence $p_2 = \frac{P_e v y_1}{A r^2}$. But since $v = k y_1$, we have

$$p_2 = \frac{P_e k}{A} \cdot \frac{y_1^2}{r^2} \qquad (3)$$

Now, by actual computation, it has been found that the ratio of the half-width of the column to the radius of gyration for all Z-bar columns is very nearly 1.73, whence $\frac{y_1}{r} = 1.73$ and $\left(\frac{y_1}{r}\right)^2 = 3.0$. Therefore, from (3) we have,

$$p_2 = \frac{3 k P_e}{A} \qquad (4)$$

Now, by adding p_1 and p_2 to find the total stress on the extreme fiber, on the loaded side of the column, we have

$$p = p_1 + p_2 = \frac{1}{A}(P + 3 P_e), \text{ or}$$

$$A = \frac{1}{p}(P + 3 k P_e) \qquad (5)$$

which is the formula to use. That is to say, to find the area of such a column, add to the total load 3 k times the eccentric load, and treat the same as a concentric load on a short column by dividing it by the chosen working stress per square inch.

In working by this rule we do not need to obtain the radius of gyration of the cross-section, and the final area is found without approximation.

The above is given to take the place of the matter now found on p. 453 of "Modern Framed Structures," and this will be inserted on that page in the next (fourth) edition of that work.

If another form of section is used, a new relation of $\frac{y_1}{r}$ might be found, but this value will be found to represent very closely all forms of columns, and to err on the side of safety for all forms other than the Z-bar form.

When it is remembered that a single building may contain four or five hundred separate columns, all of which have to be dimensioned for separate loads, the saving accomplished by the use of such a formula as the above is enormous. The formula may be considered theoretically correct for architects' use.

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THE LIMIT OF HUMAN ENDURANCE OF HIGH AIR PRESSURES.

The dangers to men working under high pressures of compressed air, due to the pressure itself, and especially to the change from the high to the normal pressure on leaving the air lock, have long been recognized and studied by engineers and physicians, and it is now well understood that only comparatively young men, of sound constitution, should be employed, that the hours of labor under pressure should be short, that the pressure should be reduced very gradually in the air-lock, that the men should rest after coming out, and that a hospital air-lock should be provided, in which men may be placed and treated with heated compressed air if chilled, afflicted by the "bends" or "caisson disease," or otherwise injured by a too sudden reduction of pressure. A hospital of this kind, as used at the Hudson River tunnel works, was illustrated in our issue of June 14, 1890.

A series of interesting experiments as to human endurance of higher pressures than are usually employed in compressed air work has recently been made by Mr. Hersent, the engineer in charge of the new harbor works at Bordeaux, France, where the quay foundations are being constructed by the compressed air system, and we take the following particulars of these tests from "Engineering," of London. As the sponge divers descend from 160 to 200 ft. without injury, it was considered that workmen should be able to endure corresponding pressures under the better conditions of an air chamber, and Mr. Hersent therefore formed a commission of doctors to work with him in ascertaining if men could safely sustain a pressure of 70 lbs. per sq. in. The test chamber was fitted with windows, a telephone, electric light and a steam coil, by which any desired temperature could be maintained.

Three men volunteered for the tests; one being a regular compressed-air workman, the second an occasional workman, and the third a man who had only entered the working chamber on a few occasions. These men were subjected to pressures for a length of time, usually about one hour. The tests were commenced with a pressure of about 28.4 lbs. per sq. in., and the pressure increased very gradually, by about 4.27 lbs. per day, to 76.8 lbs. per sq. in., while the time for the pressure reduction was increased about 10 minutes for each 1.42 lbs. increase in pressure. The period of compression was also increased, but to a smaller degree, this being of less importance. All three men sustained without difficulty a pressure of 46.9 lbs., with a reduction period of 56 minutes. One of the men, being indisposed from an independent cause, was then withdrawn. At 58.3 lbs. pressure the man who was used to working in the chamber felt some temporary inconvenience, and at 65.4 lbs. his companion, who was not accustomed to compressed-air work, had to be withdrawn, as he suffered from pains in the side. There was no trace of paralysis, but it was not considered safe for him to continue the test, which was finished by the first man alone, who sustained a pressure of 71.1 lbs. for one hour, the pressure being then reduced in 2 h. 25 mins. When released from the chamber this man took some sulphurous baths, which had cured the pains of his companion, and then underwent the final test, in which the pressure was raised to 76.8 lbs. in 45 minutes, continued for an hour, and then reduced to normal pressure in 3 h. 3 mins. The temperature was increased from 50° F. to 68° F. during the compression, maintained at 68° during the test, and then gradually increased to 86° F. during the reduction of the pressure. The man suffered no inconvenience, with the exception of a tingling sensation, which passed away after a short time. It is considered that, if certain precautions are taken, men in good health can sustain a pressure of 76.8 lbs. per sq. in., that means should be provided for heating the chamber at will, and that good ventilation should be maintained during the reduction of the pressure. As it has been proved that the workmen should rest after leaving the air-lock, especially after working under high pressures, elevators should be provided to bring the men to the surface. These experiments go to show the practicability of men working under compressed air at greater depths than have yet been attempted.

The greatest pressure thus far used in compressed-air work was 52 lbs., corresponding to a head of 120 ft., in the East River Gas Co.'s tunnel, described in our issue of July 11. This was the extreme reached on this work. The ordinary pressure was about 45 lbs., corresponding to a head of 104 ft. At the Limfjord Bridge, in Denmark, men worked for some time at a depth of 113 ft.

THE PROTECTION OF LARGE ROOFS FROM FIRE.

The Boston Manufacturers' Mutual Fire Insurance Co. recently sent out a letter asking for experience in the protection from fire of large roofs, such as those on bridge shops, rolling mills, etc. The following letter was sent in reply by Mr. H. G. Morse, President of the Edge Moor Bridge Works, and deserves the attention of all who have to do with the design of buildings for manufacturing purposes:

Edge Moor, June 24, 1895.

Edward Atkinson, Esq., President Boston Manufacturers' Mutual Fire Insurance Co.:

Dear Sir:

I had an experience with the spread of fire on a large roof in 1887. The Morse Bridge Co. shops were 450 ft. long and from 50 ft. to 75 ft. wide, with two wings. The construction was the ordinary wooden roof truss with purlins, rafters and studding at the sides, inch sheathing siding and wooden shingles. The fire started on Sunday morning at 4 o'clock in one of the wings, and the whole premises were burned within less than 1½ hours. A careful investigation of the matter by an examination of the watchman indicated that he had undertaken, with the hose arrangements, to put out the fire in the wing, but before he could accomplish this it had passed into the main shops, and, as he described it, had traveled along the belts which ran

longitudinally, and in less than two or three minutes had gone from one end to the other of the long shop.

About three years ago the Diamond State Iron Co., of Wilmington, had a similar fire in their rolling mill, which was from 300 ft. to 400 ft. long and averaged 150 ft. in width. I was called in as appraiser on the plant and made a very thorough investigation of the way the fire acted. The watchman gave a similar description of the rapidity with which the fire traveled form one end to the other.

It is reasonable to expect that the very rapid expansion of the air by heating would create a draft in a longitudinal direction under the apex of the roof, and thus carry the fire with it very rapidly to the ends of a long building. I have for the last year discussed this question from time to time with our officers with the view of putting partitions in our roof down as low as the lower chord, and spaced from 75 ft. to 100 ft. apart, depending on the length of the roof truss. The object of this is to form a reservoir for the expanded air and to confine the fire and heated air within narrow limits until sufficient time has elapsed to bring the fire department into action, and when it is brought into action, to have the fire so concentrated that effective work can be done. A properly built plank partition would, I believe, hold any ordinary fire within confined limits for a time ample to enable the fire department to get to work. The action of fire walls in a long roof would be somewhat similar to the effect produced by a series of dams placed one after another in a stream having a rapid fall. In case of the breakage of the upper dam, the second pond would have to be filled before any water could run into the third, and the same process would follow on to the last dam. You can readily understand that this would retard the flow of the stream. If, however, a sudden water spout occurred or a dam broke at the head of such a stream and no intervening dams existed, the stream would rush rapidly down and work great destruction before anything could be done to save property.

Yours truly,

H. G. Morse, President.

LEGAL DECISIONS OF INTEREST TO ENNEERS.

Validity of Surveys.

The law declares that the plats made by the county surveyors, two or more in number, shall be conclusive in all controversies relating to them—conclusive, not only as to the lines, but as to the natural objects laid down upon them. All the surveys of county boundaries and private lands made in the centuries of our colonial and national history, including three-fourths of the present century, were made by surveyor's compass, Jacob's staff and theodolite. The old surveyors possessed no long-visioned telescopes. They groped their way through forests, depending alone on the magnetic needle for their courses. But such as they were, in order to prevent infinite disputes and ceaseless litigation, the law made the lines thus run by official surveyors, and the plats describing them by natural objects, "conclusive" evidence in all controversies relating to them. These lines are fixed and established, and cannot be changed. If now the scientific skill of modern engineers, and the highly improved instruments now used by them, were applied to these old lines, if bright flags hoisted high above the tops of the trees on lofty mountain tops, and telescopes with ranges of 7 or 70 or 170 miles were employed to straighten out the existing boundary lines of states, counties and farms, a universal Babel of protest would be raised throughout the land against the injustice, the innovation, and the impertinence.—Bluefield Water-Works & Imp. Co. v. Sanders (U. S. Circ. Ct. of App.), 63 Fed. Rep., 335.

Distinction Between Manufacture and Machine in Patent Law.

A manufacture is an instrument created by the exercise of mechanical forces and designed for the production of mechanical effects, but not capable, when set in motion, of attaining by its own operation to any predetermined result. It has no inherent law which compels it to perform its functions in a given method, but receives its rule of action from the external source which furnishes its motive power. In this absence of "principle" or "modus operandi" lies the distinction between a manufacture and a machine, the former requiring the constant guidance and control of some separate intelligent agent, the latter operating under the direction of that intelligence with which it was endowed by its inventor when he imposed on it its structural law. Articles of manufacture may be new in the commercial sense when they are not new in the sense of the patent law. New articles of commerce are not patentable as new manufactures, unless it appears in the given case that the production of the new article involved the exercise of invention or discovery beyond what was necessary to construct the apparatus for its manufacture or production. An instrument or manufacture which is the result of mechanical skill merely is not patentable. Mechanical skill is one thing, invention is a different thing. Perfection of workmanship, however much it may increase the convenience, extend the use, or diminish the expense, is not patentable. The distinction between mechanical skill, with its conveniences and advantages, and inventive genius, is recognized in all the cases. The combination, to be patentable, must produce a different force or effect, or result in the combined forces or processes, from that given by their separate parts. There must be a new result produced by their union. If not so, it is only an aggregation of separate elements.—Campbell v. Bayley (U. S. Circ. Ct.), 63 Fed. Rep., 463.

Disposal of Sewage.

Where it appears that the best methods for disposal of sewage for a village involves the use of private land, and the owner refuses to accede to a reasonable plan, the United States Circuit Court holds that equity should decline to interfere by injunction with the proceedings of the village.—Colby v. Village of La Grange, 65 Federal Rep., 555.

FIG. 46. VIEW OF CEMENTED GRAVEL AFTER BLASTING.

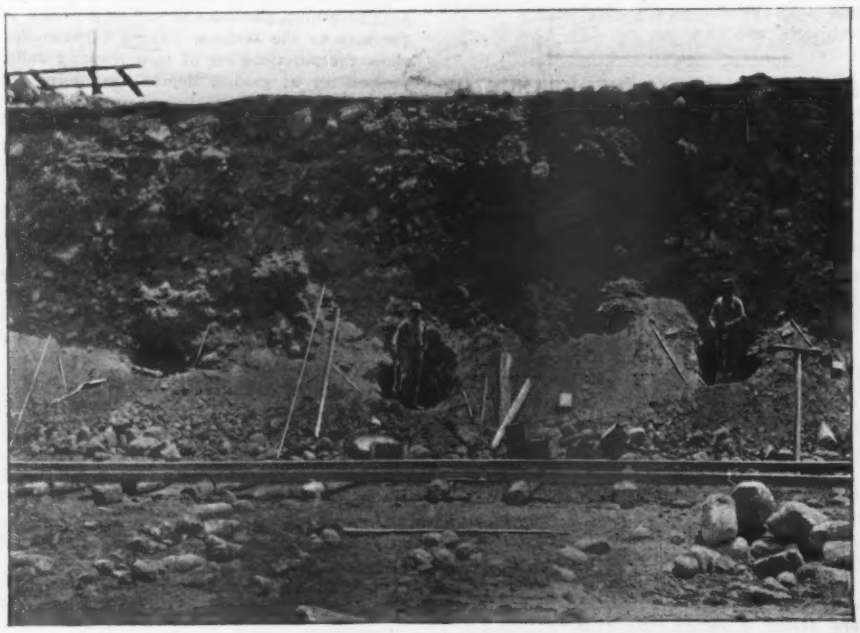

FIG. 45. VIEW SHOWING METHOD OF BLASTING CEMENTED GRAVEL BY TUNNELS, SECTION 4.

CHICAGO MAIN DRAINAGE CHANNEL.

XI.

The Lemont Division.

The Lemont Division of the Drainage Channel extends from the east end of Section 2 to the west end of Section 8, a distance of approximately seven miles, and is under the charge of Mr. Hiram A. Miller, Division Engineer, Lemont, Ill. Throughout the entire division the channel has a section practically rectangular and 160 ft. wide on the bottom, and for most of its length there will be retaining walls on both sides of the channel. In this division the excess of rock excavation over glacial drift excavation first appears, and from this point to the south end of the canal, the contractors' plant is designed primarily for rock work, just as in the preceding divisions it was designed primarily for earth excavation, and only incidentally for rock work. As stated above, the Lemont Division is in charge of Mr. H. A. Miller, Division Engineer. We are indebted to Mr. Miller for much aid in securing the information from which the articles on Sections 2 to 8, inclusive, have been prepared.

Sections 2 and 4.

These two sections are in the hands of the well-known contracting firm of McArthur Bros., of Chicago, Ill., and for this reason, although they are separated by the mile of channel comprising Section 3, they will be described together. Originally Section 3 was in the hands of the same firm, but a dispute having arisen between the contractors and the Board of Trustees over the proper classification of certain portions of the glacial drift, it was surrendered by mutual agreement without prejudice to either party, and relet to the present contractors, Gilman & Co. In fact, all three sections, Nos. 2, 3 and 4, were readvertised at this time, but before any award was made an agreement was arrived at between McArthur Bros. and the Board of Trustees for a continuation of the work on Sections 2 and 4 at an increased price for glacial drift excavation.

We have not space to enter into a full statement

FIG. 47. VIEW OF CEMENTED GRAVEL AFTER STEAM SHOVEL HAS REMOVED LOOSE MATERIAL.

of the reasons for this action, but briefly they were as follows: The Trustees readvertised Sections 2, 3 and 4, and bids were opened on Oct. 4, 1893, as follows:

	Section 2.			Section 3.			Section 4.		
	Glacial drift.	Solid rock.	Retaining wall.	Glacial drift.	Solid rock.	Retaining wall.	Glacial drift.	Solid rock.	Retaining wall.
	—cts.—		$	—cts.—		$	—cts.—		$
Christie & Lowe.	75	75	2.00	72	72	2.00	... ...		....
Dawson, Symms & Co.	45	98	2.25	45	98	2.25	47	100	2.25
McMahon & Montgomery Co.	... ...		..	..	....		100	250	3.50
Sinclair Cons. Co.	... ...		..	32	86	2.00	... ...		...
Ezekiel Smith	73	93	2.25	73	93	2.25	73	93	2.25
McKeown, Stowell & Co.	48	84	1.80	46	82	1.78	46	84	2.26
Strang & Lee.	62	90	2.00	59	85	2.00	59	90	2.00
F. H. Clement	68	68	2.00	72	72	2.25	68	68	2.00
Winston Bros. & Stevens	... .		..	... ...		70	110	3.50	.. ..
C. C. Gilman	... .		..	... ...		56	76	1.80	.. ..
Mason, Hoge & Co.	48½	89	1.75	45	89½	1.75	49	89⅝	1.75

On Oct. 17 McArthur Bros. submitted a proposition to do the work for the following prices:

	Glacial drift.	Solid rock.	Retaining wall.
Section 2.	50 cts.	80 cts.	$1.74
" 3.	56 "	76 "	1.75
" 4.	49 "	80 "	1.87

At McArthur Bros'. prices the aggregate cost of the work on Sections 2 and 4 was several thousand dollars less than that by any of the other bids submitted. On Section 3 the prices of Gilman & Co. made the cost of the section less than did the prices of McArthur Bros. On Oct. 25 the Board of Trustees authorized McArthur Bros. to go ahead with the work on Sections 2 and 4 at the revised prices which they offered, and secured the surrender of Section 3 to Gilman & Co., as noted above. At no time during the controversy were any of the sections out of the hands of McArthur Bros., nor was work suspended by them until Section 3 was surrendered by them to Gilman & Co.

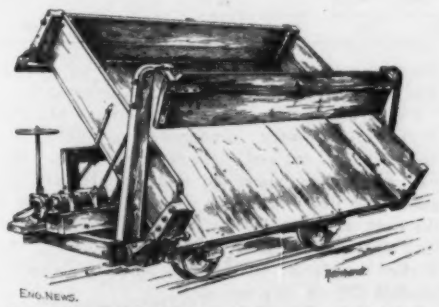

Fig. 48. Peteler 3-cu. yd. Dump Car, Used on Sections 2 and 4.

Under the original contract for Sections 2 and 4 the prices for excavating glacial drift were 28 cts. and 27 cts. per cu. yd., respectively, but with the new contract these prices were raised to 50 cts. and 49 cts. per cu. yd., respectively. About 59,000 cu. yds. of glacial drift on Section 2 and 48,500 cu. yds. on Section 4 were excavated at the original prices, which left 700,314 cu. yds. of glacial drift and 472,624 cu. yds. of solid rock on Section 2, and 957,062 cu. yds. of glacial drift and 341,020 cu. yds. of solid rock on Section 4 to be excavated at 50 cts. and 49 cts. for glacial drift, and 80 cts. for solid rock. The respective costs of the two sections at the prices given above will be $922,256 and $1,022,199.

In the following description the features of the work common to both sections are given first, and then the features peculiar to each section are described under the heading of that section.

When Sections 2, 3 and 4 were put under contract the floods of the Desplaines River, which crossed and recrossed the route several times, had converted the land occupied by the proposed channel into a lake for a considerable portion of its area, while a thick growth of hardwood timber and underbrush covered the remainder of the line. The first work was therefore to lay dry the sections by the construction of levees at the most practicable points, and then to clear the timber from the right of way. That this work was a considerable undertaking is indicated by the fact that $100,000 was expended in clearing, grubbing and building levees in order to get in shape to do work on the main channel. The manner of carrying on this preliminary work is worthy of no especial note. The material for the levees was taken from the main channel where it could best be obtained, and put into the embankments by means of wheelbarrows, teams, scrapers, etc. This preliminary work was, of course, done for all three sections, and, in fact, 73,310 cu. yds. of glacial drift excavation was done on Section 3 before it was readvertised, but the remaining work described here was done on Sections 2 and 4 only.

Excavation in the main channel on Sections 2 and 4 began in August, 1892, and was prosecuted through the winter of 1892-3 until some time in July, 1893. In September, 1893, work was begun on the driver diversion channels opposite these two sections, and was completed in the early part of December. During the work on the river diversion channel, and, in fact, during the entire summer of 1893, little work was done on the main channel on account of the dispute over hard material then pending. In November, 1893, excavation was begun on the main channel, and has been continued vigorously ever since.

During the fall and winter of 1893-4 the excavation was carried on entirely by hand, loading into 1-cu. yd. Peteler dump cars. The material on both sections after the top soil is removed is cemented gravel overlying lime rock. This cemented gravel is a glacial deposit, consisting of a mass of gravel and boulders from a few inches to 2 or 3 ft. in diameter, firmly cemented together with lime and iron. Some idea of the character of this material may be obtained from Figs. 45, 46 and 47, all of which are views of the work on Section 4. Fig. 45 shows the method of driving small tunnels into the bank for blasting, the explosive being placed at the inner ends of the tunnel. Fig. 46 shows the appearance of the bank after the blast is fired, and Fig. 47 its appearance after the steam shovel has gone through and removed the loose material. As furnishing some further evidence regarding this material, the following extract from a letter from the contractors is given:

The nature of the material on these two sections was of so hard and difficult a character that it was questionable whether any other means than the pick and shovel and powder could remove it. The previous spring's (1893) operation with one steam shovel had seemed to demonstrate the practical inability to remove the material by such methods. However, on Section 4, one steam shovel was started to work in March, 1894, as soon as the main pumping station at that point was installed, and another one was added at the same point in April, the work on Section 2 being meanwhile prosecuted by hand-loading and small cars. In May one steam shovel was installed on Section 2, and again on June 6 another one was placed in service on this section, both being started, as was the case on Section 4, to work in opposite directions from the main pumping station, which had been installed on the section. There was a third shovel installed on this section in October, 1894.

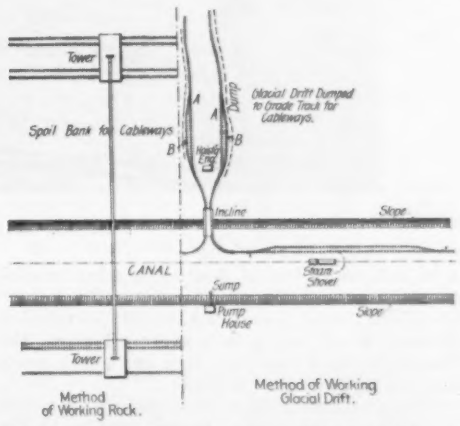

Fig. 49. Sketch Plan Showing Method of Excavation on Sections 2 and 4.

The plan of working with the shovels has been to strip the rock by making a through cut along one side of the channel, working down the slope by a series of steps until the rock was reached. The spoil from the shovels has been conveyed out of the pit in tram cars operated by teams and cable inclines, as will be described further on.

Section 2.—Practically all of the glacial drift excavated on this section has been used in grading tracks for the traveling cableways employed in excavating the rock. To excavate the glacial drift two 70-ton Osgood excavators and one 60-ton Bucyrus special contractors' shovels have been used, loading into Peteler cars of 3 cu. yds. capacity. These cars have given unusually satisfactory service. Fig. 48 is a view of one of them. Altogether 63 are used on this section. From the shovels the cars are hauled by teams to the foot of cable inclines, thence up the incline by cable, and from the top of the incline to the dump by teams. The arrangement of the tram car tracks and shovel is shown by Fig. 49, and Fig. 50 gives a view of one of the inclines. This particular incline is located on Section 4, but it differs in no essential particular from those on Section 2.

The sketch of the car tracks and incline is a typical sketch. It will be noticed that the tracks on the dump are so arranged that the empty and loaded trains can pass each other; that is, loaded cars can be run onto track A and dumped, while empty cars are sent back to the incline by track B. The contractors have experienced no difficulty with this arrangement in keeping the shovels at all times supplied with cars. One of these inclines has handled as many as 2,500 cu. yds. per day. The inclines have been started in each case opposite the pumping stations, a cut having been excavated across the channel by hand labor, and they are moved whenever the haul becomes too great.

The hoisting plant for these inclines are all similar in character, although, of course, differing in the make and size of machinery used. They consist essentially of a hoisting engine mounted on an especially designed platform car 18 ft. wide by 40 ft. long, as shown by Fig. 51. This particular machine is a Lidgerwood 12½ × 16-in. double-drum engine, while its companion hoist is a 13 × 16-in. double-drum Webster, Camp & Lane engine. The two views, Figs. 50 and 51, show the construction and operation of the inclines very clearly. It may be stated that in addition to these main hoists for steam shovel work there are two 8 × 10-in. double-drum engines operating inclines for the 1-cu. yd. Peteler cars which are loaded by hand. There are 185 of these small cars on Section 2.

Figures obtained both from the contractors and from the engineers of the Sanitary District are available to show the work of the steam shovels on this section. According to the canal engineers the two Osgood shovels worked 18 and 24 ten-hour shifts in October, 1894, and handled 340 cu. yds. and 395 cu. yds. per shift, respectively, and the Bucyrus shovel worked 23 ten-hour shifts, handling 630 cu. yds. per shift. In the month of November all three shovels working together aggregated 71 shifts, and averaged 471 cu. yds. per shovel per shift.

The contractors state that the largest ten-hour day's work was done on Aug. 2, 1894, by one of the Osgood 70-ton shovels, when 1,248 cu. yds. pit measurement were handled. The largest daily-monthly average was made by the same shovel in July, 1894, and was 690 cu. yds. per day. The largest daily general average, from June 6 to Dec. 31, 1894, was also made by this shovel, and was 495 cu. yds. The general daily average of all shovels from the time of installation to Dec. 31, 1894, was 415 cu. yds.

Considering the large size of shovel employed, and also that all three were made for this heavy work, this average seems small; yet it is good average work considering the intractability of the material. That the shovel is capable of doing better work with more favorable material is shown by the statement that the big Osgood shovel has shown an (monthly average) output per day of 1,200 cu. yds., and for special daily runs has doubled this output.

The large amount of seepage water encountered on this section has required an extensive plant for draining the work. The main pumping stations are located about 1,000 ft. from each end of the section, and each is equipped with two 75-HP. boilers, one 14 × 18-in. balanced valve Erie engine, and two Heald & Sisco centrifugal pumps 12 ins. and 6 ins. in diameter. The pumps are placed at 18 ft. above the finished grade of the canal, and are operated by belts from the engine placed on th berm. These two main pumping stations have thu- far been operated practically continuously, handling about 14,000,000 gallons every 24 hours, with a l f of 36 ft. In addition to the two main pumping sta- tions there is one auxiliary station placed about th- middle of the section and equipped with one 6-in. centrifugal pump; and for much of the time each shovel has been equipped with a pulsometer, to keep the shovel pit dry. These pulsometers simply pump the water out of the shovel pit to be rehandled by the main pumps. This is made necessary on account of the uneven surface of the rock, and because it was cheaper to pump the water twice than to ditch through the solid rock. As will be seen, the item of drainage is one of very considerable importance. For all pumps together 0.83 ton of coal was used per 1,000,000 gallons of water handled in 1894, and the total cost of pumping, exclusive of cost of plant, was 2½ cts. per cu. yd. of material excavated.

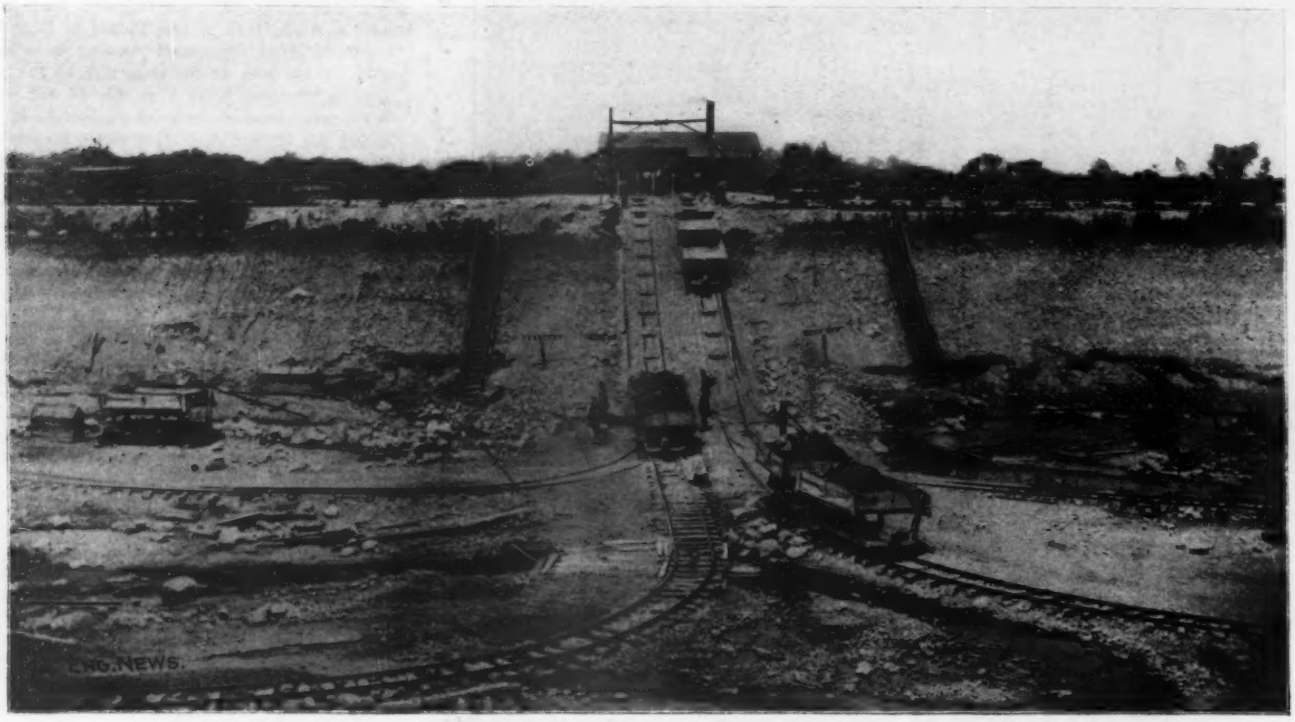

FIG. 50. CABLE INCLINE FOR HAULING GLACIAL DRIFT OUT OF THE PIT.

TABLE II.—Showing Amount of Rock Handled, Number of Men Employed, and Wages of Employees for Each of Four Lidgerwood Traveling Cableways at Work on Sections 2 and 4, in March, 1895.

	Section 4. 1.	2.	Section 2. 3.	4.
No. ten-hour shifts	49	35	52	49
" skips worked on each face.	10	10	10	10
" laborers " " " "	27	27	32	32
" foremen " " " "	2	2	2	2
Wages laborers per day	$1.50	$1.50	$1.50	$1.50
" foremen " "	3.00	3.00	3.00	3.00
" engineer " "	2.75	2.75	2.75	2.75
" fireman " "	*1.80	1.80	1.80	1.80
" towerman " "	*2.70	2.70	2.70	2.70
Total cu. yds. excavated	12,633	8,632	16,162	14,535
No. skips loaded day shifts	5,117	5,327	5,435	4,389
" " " night "	4,087	1,201	5,467	4,468
Av. load skip, cu. yds., in pl.	1.44	1.32	1.48	1.65
Cu. yds. mat'l exca. per shift.	257.8	246.6	310.8	296.6
Total hours labor	12,861	9,608	17,075	15,227
Cu. yds. exc. per man per shift	9.82	8.98	9.46	9.54
Tons coal burned per shift	1.83	1.83	2.28	2.28

* These men in every case worked 12-hour shifts, all others 10-hour shifts.

TABLE III.—Showing Percentages of Total Cost of Excavating Rock for One Month by Lidgerwood Traveling Cableways on Sections 2 and 4, Which Are Chargeable to Different Items of Work, and also the Percentages of Each Item of Work Which Are Chargeable to Labor and to Supplies.

Character of work.	Section 4. Cableway No. 1. Labor.	Supp's.	Total.	Cableway No. 2. Labor.	Supp's.	Total.	Section 2. Cableway No. 3. Labor.	Supp's.	Total.	Cableway No. 4. Labor.	Supp's.	Total.
Drilling	22	12.44	19.17	24.15	11.42	19.72	15.19	7.85	12.23	16.81	9.31	13.44
Blasting	2.32	54.66	20.22	3.11	59.20	22.23	3.16	50.9	22.30	2.47	49.2	20.00
Loading	47.9	2.44	32.19	43.6	....	28.29	49.30	2.55	30.36	46.1	1.81	29.4
Conveying	15.03	20.75	16.95	14.7	18.21	15.92	13.41	22.85	17.24	15.0	22.25	17.62
Channelling	3.83	2.75	3.44	5.14	2.61	4.44	8.50	4.26	6.99	9.0	4.33	7.17
Pumping	3.16	6.76	4.25	4.15	8.35	5.87	4.12	11.59	7.09	4.21	12.10	7.32
Supt. & gen. lbr.	5.76	....	3.77	5.15	....	3.53	6.32	....	3.78	6.41	....	4.05
Totals	65	35	100	65	35	100	60	40	100	63	37	100

Section 4.—The method of handling the material on this section corresponds in all essential respects to that just described for Section 2—viz., steam shovels loading into cars, teams hauling cars to foot of inclines, where they are hoisted and the spoil wasted on the dumps. There are four steam shovels —one 70-ton Osgood, one 60-ton Bucyrus "Special Contractors'" shovel, one 45-ton Bucyrus boom type shovel and one 45-ton Bucyrus crane type shovel— and three hoisting plants, similar to those described

For handling the rock two cableways are used, with the necessary channeling machines, rock drills, etc., to cut and blast the rock ahead. Sullivan channeling machines and the Ingersoll-Sergeant and Rand drills are used. Before taking up the work of the cableways on rock, it may be stated that during November, 1894, one cableway was worked on glacial drift for 25 ten-hour shifts, and handled 337 cu. yds. per shift.

on Section 2. The section also has two main and one auxiliary pumping stations, two cableways and the usual outfit of channelers and drills.

It may be noted at the beginning that both here and on Section 2, 750 ft. was found to be the limit of economical haul. The tracks from the foot of each incline, therefore, run 750 ft. each way, or, in other words, the glacial drift from 1,500 ft. of canal could be handled without moving the incline.

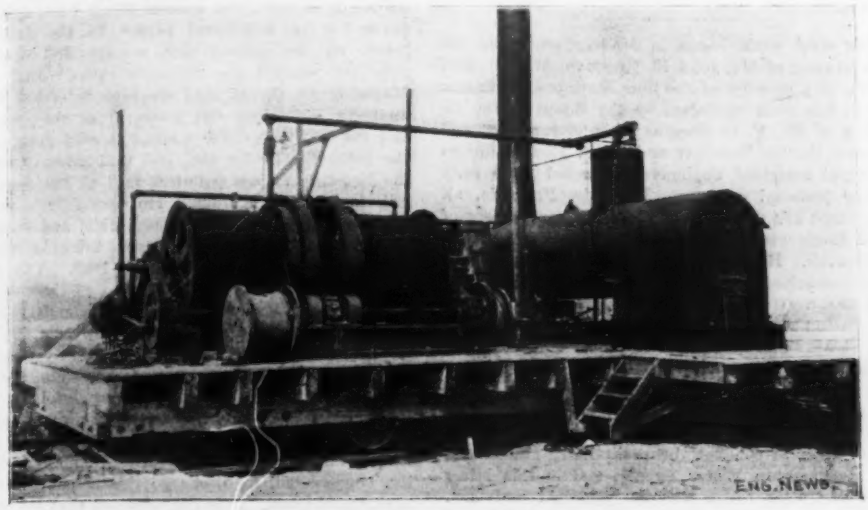

FIG. 51. VIEW OF HOISTING MACHINERY FOR CABLE INCLINE.

According to the reports of the engineers of the Sanitary District for October, 1894, the Osgood shovel worked 27 ten-hour shifts, handling 406 cu. yds. per shift, and the three Bucyrus shovels named above worked respectively 27, 24 and 26 shifts, and handled 760 cu. yds., 458 cu. yds. and 480 cu. yds. In November all four shovels worked in the aggregate 103 ten-hour shifts, and each handled 490 cu. yds. per shift.

According to the contractors, the largest day's record for any shovel on this section was made on July 17, 1894, by the No. 1 boom type, 45-ton, Bucyrus shovel, and was 1,530 cu. yds. pit measurement. The largest monthly average per day was made during the same month and by the same shovel, and was 791 cu. yds. The largest general daily average for the season from the time of the installation of the shovel to Dec. 31, 1894, was made by the 60-ton Bucyrus "Special Contractors'" shovel, and was 594 cu. yds. The general daily average of all shovels for the season was 493 cu. yds. The good record made by one of the smaller shovels in comparison with the records made with the larger shovels is explained by the statement that the machine was only put into such material as it was thought best fitted to handle. Some of the material encountered on the section could not have been handled by this shovel at all. This shovel is shown in Fig. 52, which also shows the cut being made. It will be noticed that the face stands practically vertical, and that it shows very slightly the cutting marks of the dipper teeth. In other words, the action of the dipper teeth is the breaking, tearing action natural with a hard cemented gravel. It must be borne in mind, too, that the bank has been blasted, though the finished face shown in the photograph is probably somewhat beyond the limit of the blast's effect.

As has already been mentioned several times, the cemented gravel has to be blasted ahead of the shovel in order to be handled with any success at all. The method of blasting on Section 2 is to drill down from the surface with a steel bar, putting the holes down as near to the bottom as possible. This drilling has proved very difficult with the rounded pebbles and boulders, of which the material is made up. On Section 4 the method which is generally employed is to tunnel into the face of the pit (Fig. 45) for a distance of 18 ft. to 20 ft., the workmen blasting their way in much as would be done in tunneling, and then charge the excavation with a large quantity of dynamite. The contractors state that this has proved the only effective method of handling the material.

Cableway Work.—As has just been stated, four Lidgerwood traveling cableways are used for handling the rock on Sections 2 and 4. This machine has been described in a preceding article, and in this article attention will be confined to the capacity, cost of operation, etc., of the four plants just mentioned.

The capacity of the cableways and the cost of operating them of course vary from month to month, and even from day to day; the hardness of the rock, character of the weather, efficiency of labor and superintendence, and dozens of other variables entering into the problem. This makes it very difficult to present any figures which are a reliable basis of estimate for cost and efficiency in all classes of work. It should be borne in mind, therefore, that the figures of cableway work given for Sections 2 and 4, and indeed for any other section which may be referred to in future articles, are absolutely accurate for the particular conditions there obtaining only. At the same time, by a careful comparison of controlling conditions, figures for one piece of work may be useful in estimating the cost of another piece of work.

Through the courtesy of McArthur Bros., the contractors for Sections 2 and 4, we have been furnished with some very accurate figures of the work of the four cableways employed. These figures give the cost of various items of work entering into the excavation and conveying of rock in percentages chargeable to labor and to supplies. The actual cost of the work in cents per cubic yard excavated is not given for obvious reasons.

Table II. shows the number and wages of the laborers, capacity per machine, capacity per laborer, etc., for each cableway for one month. Table III. shows percentages of cost of the various items of work which are chargeable to labor and to supplies. The tables are self-explanatory, and need not be described further. It will be noticed that the cost of "conveying," that is, taking the loaded skip to the spoil bank, dumping it, and returning it to the pit, is about from 15% to 18% of the total cost of work. This item will vary the least for different pieces of work. The cost of drilling, blasting and channeling will vary with the character of the rock; the cost of loading with the capacity of the laborers and the efficiency with which they are worked, supposing the rock to be broken to the most convenient fineness for handling at all times; the cost of pumping with the amount of seepage.

The main shops, storehouses and general headquarters of the contractors for both Sections 2 and 4 are located on Section 4, where connection has been made with the Chicago & Alton R. R. by means of a spur track. All supplies are received here and distributed to the two sections as needed. The repair shops are unusually elaborate, being equipped with engine lathes, drill presses, planers, steam hammers, and, in fact, everything necessary for doing heavy repair work. So great has been the repairs on the steam shovels, that these shops are run practically continuously night and day. In the storehouse are kept duplicate parts of all machinery in connection with the steam shovels, and a large supply of tools, iron, heavy hardware, etc., found necessary. On Section 2 there are smaller camps for the laborers and a supplementary storehouse, etc.

The cost of labor, of course, varies somewhat for different months. For the month of December, 1894, it was $2.03 per nine-hour day per man on Section 4, and $1.73 per nine-hour day per man for Section 2. The greater cost of labor on Section 4 is accounted for by the larger number of skilled workmen employed by the shops.

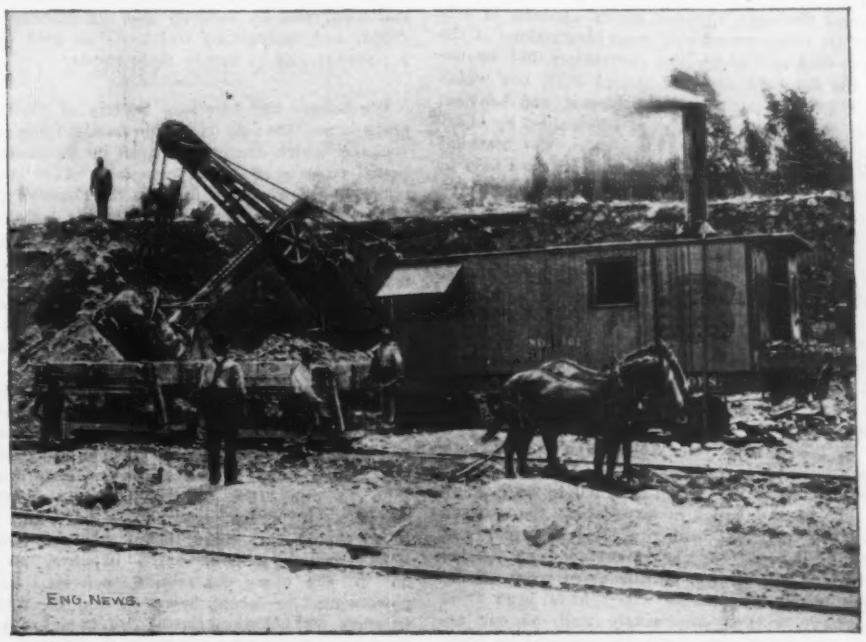

FIG. 52. VIEW OF BUCYRUS BOOM TYPE EXCAVATOR, LOADING DUMP CARS, SECTION 4.

For the matter from which this article and the illustrations accompanying it have been prepared, we are indebted to the contractors, McArthur Bros., of Chicago, and the engineers of the Sanitary District of Chicago.

ENGINEERING NEWS

AND

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In the installment of our series of articles on the Chicago drainage channel which appears in this issue are some remarkably good illustrations of the "hard digging" which the contractors bid on under the innocent name of glacial drift, but which has taxed the powers of the biggest and heaviest steam shovels to remove, even when aided by blasting. As seen by our photographs, the material consists of pebbles and boulders of all sizes held in a matrix of finer material, which has become so firmly cemented, probably by the action of percolating waters carrying lime and other mineral salts in solution, that it has become almost like rock in solidity. Yet glacial drift it certainly is, as that term is defined in the contract, and there can be no little doubt that the Trustees of the Sanitary District were right in holding the contractors to the strict terms of their agreements. Had the material been found much easier to excavate than was expected, the sole benefit would have gone to the contractors and, as the old saw has it, it's a poor rule which won't work both ways.

The machinery which has been put to work along the line of the canal in excavating the various classes of material which are encountered, and conveying it to the spoil bank, has not been equaled for variety, we believe, on any great work. Some of the novel experiments which have been tried there have worked surprisingly well, as our accounts show; and any contractor undertaking work involving large excavation in future, will do well to study the results obtained by the contractors on the drainage channel.

We publish elsewhere accounts of an experiment in which a man endured without injury an air pressure of 76.8 lbs. per sq. in., corresponding to a depth of 177 ft. below water level. This is more than 20 lbs. greater pressure than has ever been actually used in work carried on under compressed air. It could by no means be certainly said on the strength of Hersent's experiments that work could actually be prosecuted under such a high pressure. At the same time, experience has shown, we believe, that if proper care is taken to prevent workmen from passing through the air-lock too rapidly, the caisson disease gives little more trouble at high pressures than at moderate pressures. It is by no means unlikely, therefore, that the next few years may see works carried out under pressures as high as those used in Mr. Hersent's experiments.

The good work begun in Massachusetts by the appointment of Mr. John R. Freeman, M. Am. Soc. C. E., as a member of the new Metropolitan Water Board has been continued by the Board in the selection of Mr. F. P. Stearns as chief engineer, and Messrs. Dexter Brackett and T. F. Richardson as principal assistant engineers, as noted more fully in our personal columns. Like Mr. Freeman, all these men are members of the American Society of Civil Engineers, and have special qualifications for their work. Both Mr. Stearns and Mr. Richardson were connected with the preliminary studies for, and the construction of, the Sudbury division of the Boston water-works, while for nearly ten years Mr. Stearns has been Chief Engineer of the Massachusetts State Board of Health, in which connection he has been making constant studies of the water supply of the state, including, of course, that of Boston and vicinity. In this capacity he was called upon to conduct the preliminary studies for the Metropolitan Water Supply, and in this latter work Mr. Richardson was his principal assistant. Mr. Brackett has been intimately connected for 35 years with the distributing and pumping service of the Boston water-works, and he made some special reports in connection with the present Metropolitan scheme.

The work to be undertaken by the Metropolitan Water Board will be of great magnitude, including at the start an immense dam and reservoir, a long and large aqueduct partially in tunnel, many miles of large distributing pipe and some pumping stations and other accessories. It presents an especially attractive field for contractors, both because of its magnitude and because the standing of the Board and its engineers is a guarantee that the work will be honestly and intelligently prosecuted, and contractors will have no need to seek a political pull to secure their rights.

We believe the American Society of Civil Engineers is now the only one of the national engineering societies which does not furnish its members with bound volumes of its "Transactions." It is true that under the plan now in force in the Society, of publishing the "Transactions" in monthly installments a heavy expense would be incurred if the papers now sent out were to be entirely duplicated. But it should be possible for a member to send to the Society headquarters his accumulated file of monthly numbers and receive them back neatly bound without expense. Even if the members were charged with the cost of the binding, it would be a great convenience to them to be able to have their volumes bound in uniform style, and at the moderate price which can be secured by making a contract for a large edition. But in view of the fact that the annual dues of the Society are $10 higher than in any other of the national engineering societies, it seems reasonable that the members should at least have their "Transactions" bound without extra expense, as they do in the other engineering societies. If the powers that be decide, however, that the Society's treasury will not stand this burden, then for the convenience alone to the members, facilities for binding the volumes should at least be afforded. Not a few members of the Society are located where access to a bindery is difficult and expensive, and if they would not have each yearly volume bound in a different style, a sample volume from the set already bound must go to the binder for a guide, and perhaps during its stay there may be urgently needed for reference by its owner. Much more might be said concerning the inconvenience to the members of the present system, or lack of system, but the case seems so plain a one that further presentation is unnecessary.

The water supply question at Chicago gives the officials who are responsible for it no peace. Complaints as to quantity alternate with those regarding quality. After expending hundreds of thousands of dollars on extending the intake tunnels, one to a four and two to a two-mile distance from shore, it was urged that great additions must be made to the pumping plants. Hardly had the agitation on this point quieted down when demands arose for an additional tunnel to the four-mile point, on the ground that sewage and drainage pollution reached the two-mile cribs. And now Mayor Swift claims that the records of the water analysts show that the water from the two-mile and the four-mile cribs is about equally good, when the former is fit for use, and that when water at the two-mile crib is polluted, that at the four-mile crib is often dangerous. He therefore considers further tunnel extensions inadvisable, and seems to strongly favor immediate steps towards the diversion of all sewage from the lake. The great drainage channel is designed for exactly this purpose, and as soon as completed it is expected that it will do much to that end by diverting the flow of the sewage-laden Chicago River away from the lake. But not all the sewers of the city empty into the river. Those now discharging into the lake must either be reconstructed with a reversed grade, which seems unlikely, or intercepting sewers must be provided and pumping stations, in all probability, constructed, to discharge this sewage into the drainage channel. It is not expected that the drainage channel will be completed before 1897, but the Mayor seems to be on the right tack in suggesting that intercepting sewers should be put under way so as to be ready for use as soon as the canal is completed. New tunnels could not be ready before that time, and it would seem sensible for the city to decide whether the tunnels need be extended beyond the two-mile point if the drainage channel is to effecually divert the Chicago River and if all the sewage were diverted from the lake. Unfortunately for Chicago, the personnel of its department of public works, under which nearly all municipal improvements are carried out, changes with each city election, and the incumbent of the office of city engineer even oftener. Under such circumstances it can scarcely be expected that a definite policy of public improvement will be adopted, or if adopted, that it will be carried out, except where one administration has gone so far in the expenditure of money that another cannot retreat. The drainage channel work, as our readers will remember, is under a board that is organized quite independently of the city government.

PROGRESS AND PROSPECTS OF THE METRIC SYSTEM.

The questions of the advisability of introducing the decimal system of calculations and coinage and the metric system of weights and measures in countries where at present there are in use various and complicated systems was considered at the recent London meeting of the International Railway Congress, and we give in another column an abstract of the paper then presented by Mr. J. L. Wilkinson, Chief Goods Manager of the Great Western Ry. of England. From this it will be seen that while the author favors the decimal system and recognizes its superiority, he holds that its adoption by the English-speaking races must be a work of time. Until further Parliamentary action has been taken he does not recommend the use of the decimal system in transacting the domestic business of English railways, but he does urge upon the representatives of Great Britain, its colonies and its dependencies to adopt all practicable means to induce their respective governments to bring the metric system into use. In the mean time he sees no great difficulty in arranging a standard of exchange for moneys and in fixing equivalent values for weights and measures, to be used conjointly with the local bases of values in the various countries; and he recommends that in all published proceedings of the Railway Congress in English, the metric equivalent of all values be added. The usual objection urged is the difficulties that will ensue in introducing the new system; but already one at least of the English manufacturers of ma-

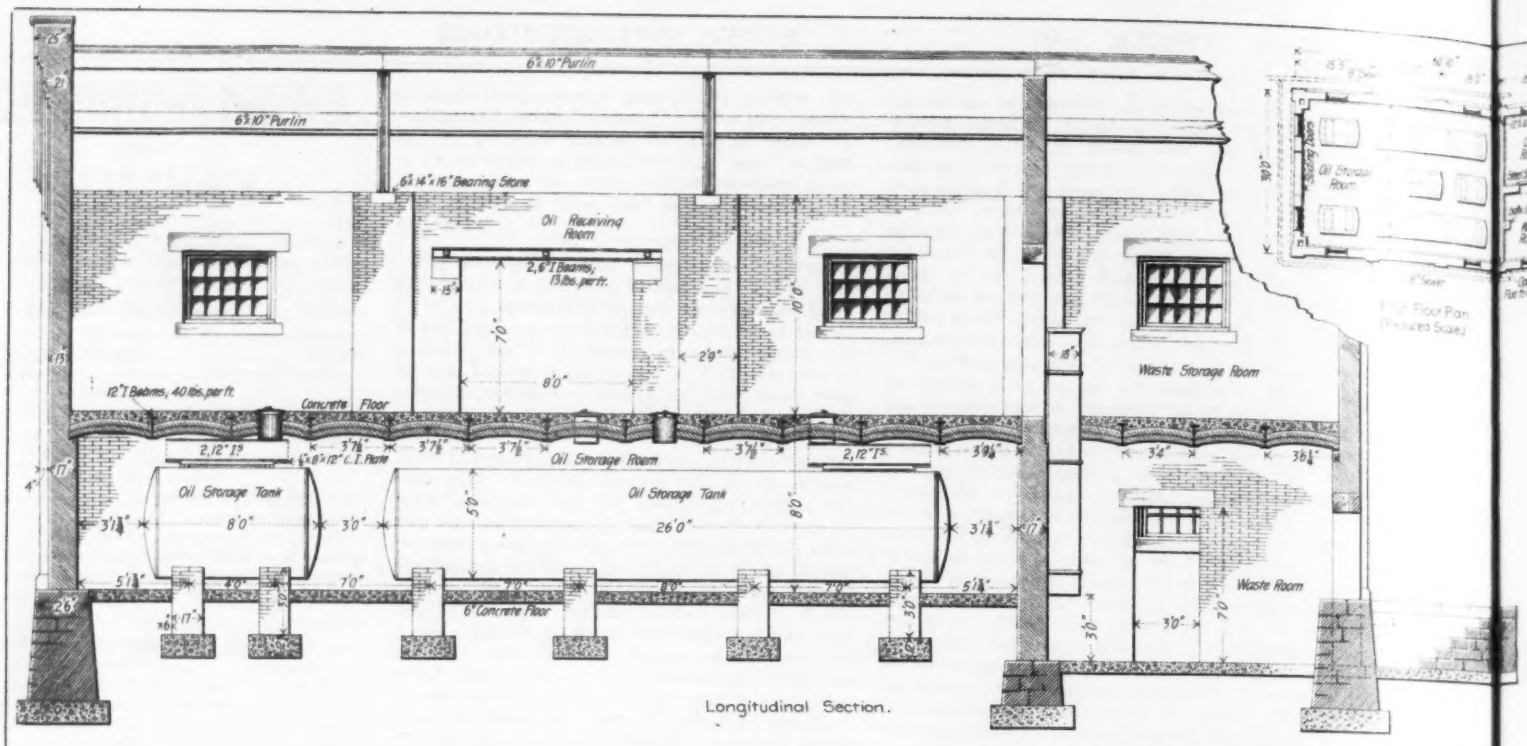


FIG. 6. PLAN AND SECTIONS OF FIRE PROOF OIL HOUSE.

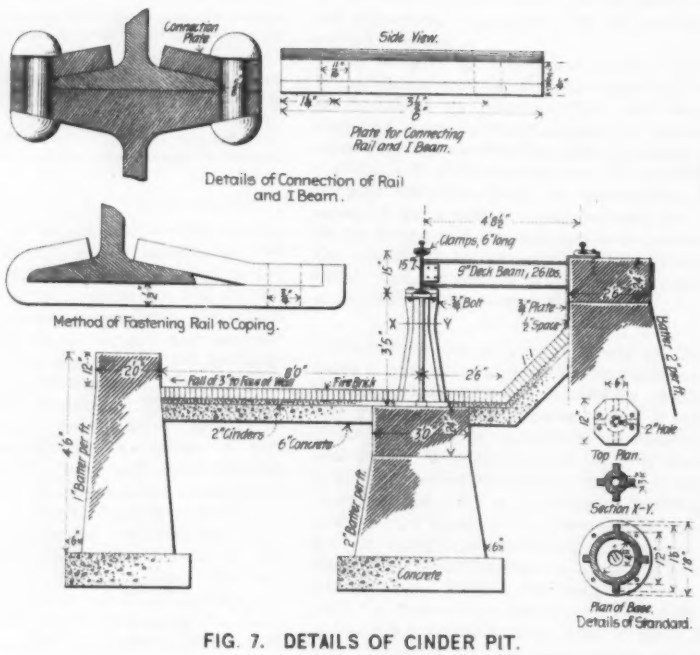
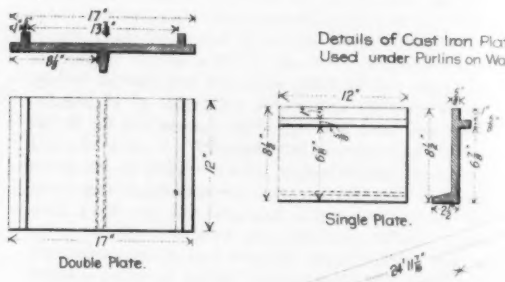


FIG. 7. DETAILS OF CINDER PIT.



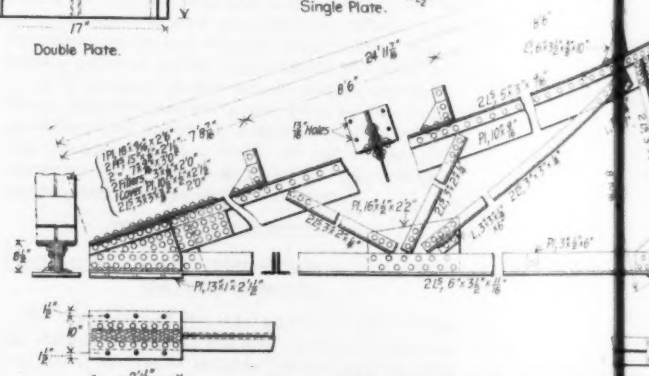
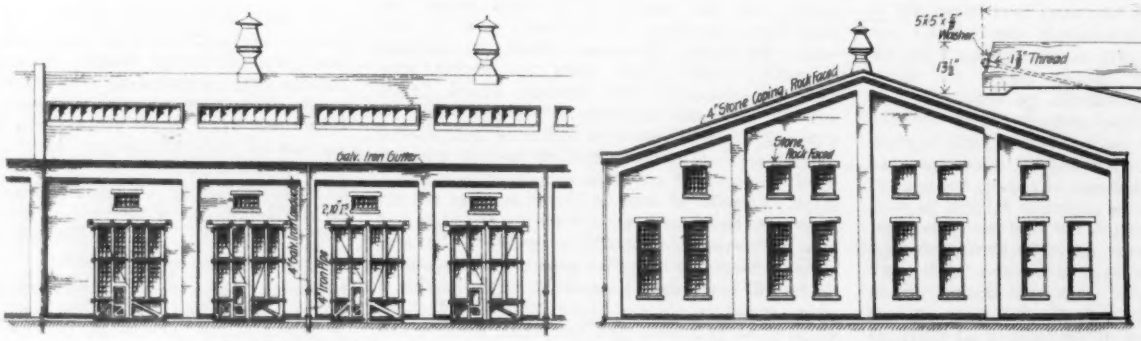
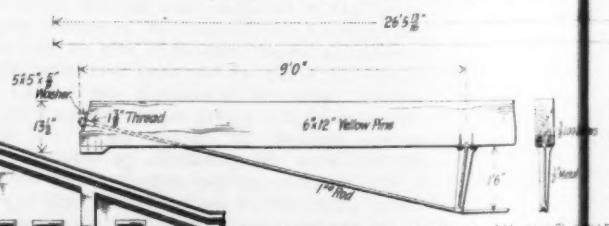


FIG. 4. ROOF TRUSS FOR MACHINE SHOP.





Trussed Purlin for End Panels of Machine Shop and Eas

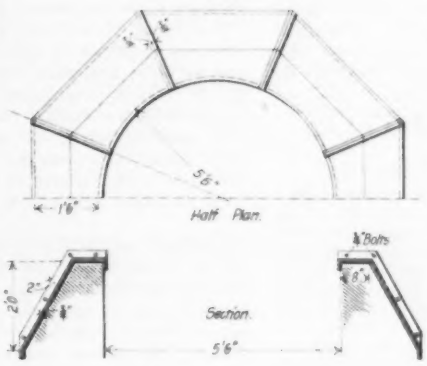
FIG. 3. ELEVATIONS OF MACHINE SHOP SHOWING STYLE OF EXTERIOR CONSTRUCTION.

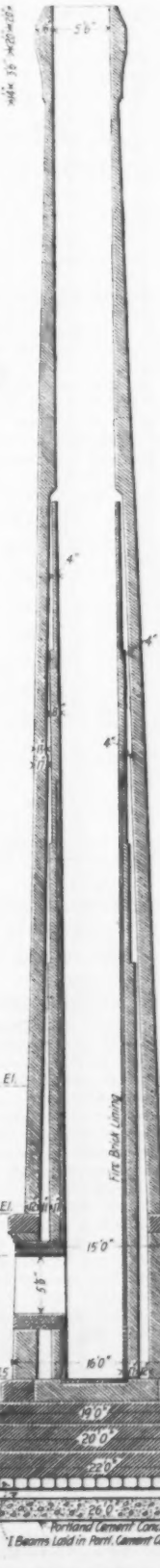
SHOPS AT LAFAYETTE, IND., FOR LOUISVI

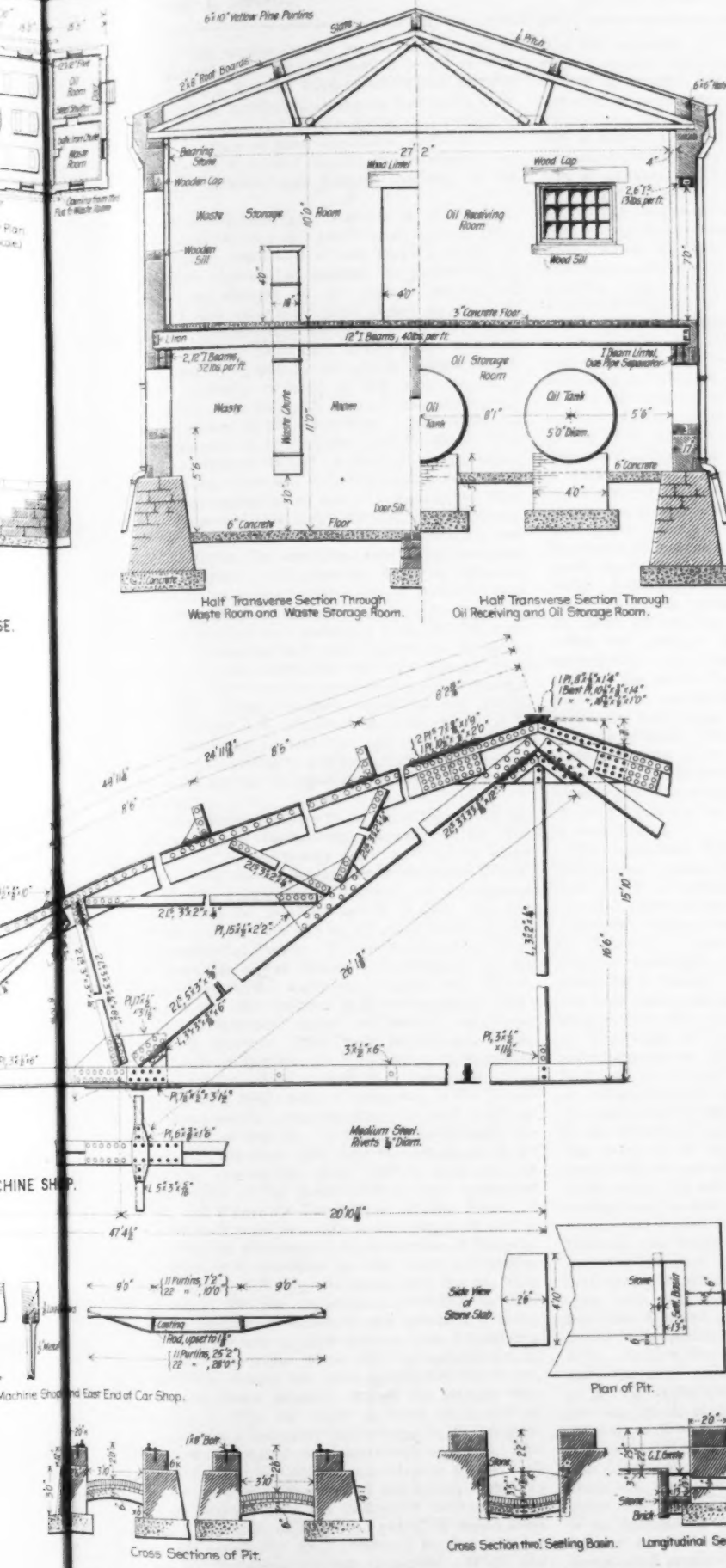
Ferd. Hall, Chief

Half Transverse Section Through Waste Room and Waste Storage Room.

Half Transverse Section Through Oil Receiving and Oil Storage Room.







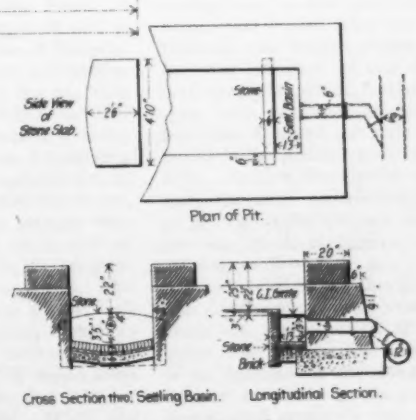
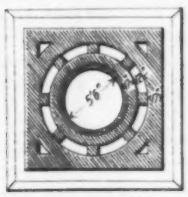
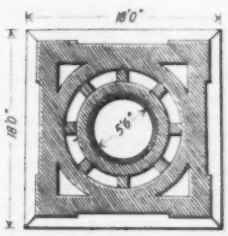


FIG. 2. DETAILS OF CATCH BASIN FOR PITS IN LOCOMOTIVE ROUND HOUSE.

Section at El. 105.5



Section at El. 93.5.



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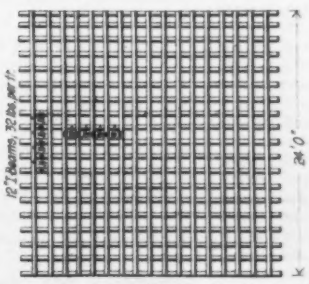


Plan of I Beam Foundation Courses.

FIG. 5. CHIMNEY 130 FT. HIGH FOR POWER PLANT.

OR LOUISVILLE, NEW ALBANY & CHICAGO RY.

. Hall, Chief Engineer.

ENG. NEWS.

CHAS. HART & SONS, LITH., 26 VESEY ST., N. Y.

chinery has adopted metric measurements, and in the discussion of Mr. Wilkinson's paper it was stated that in Austria, where nearly every province had formerly a different system of its own, a commission has succeeded in introducing the metric system in the face of great opposition, and that in a very few years it was adopted in the schools and by manufacturers, and became familiar to the public.

We have appended to the abstract of Mr. Wilkinson's paper the copy of a report made in July, 1895, by a select committee of the English House of Commons, appointed to consider the advisability of introducing changes in the present system of weights and measures. This report recommends that the metric system should be at once legalized, should be made compulsory in two years, and that it should be taught in all schools. This report, while important in itself, is still more important as coming from England, which is the most prominent adherent to the old systems. This committee was composed of 17 members, with Sir Henry Roscoe as chairman. It held 14 meetings and examined 30 or more witnesses, including among these such prominent engineers and men of science as Sir William Thomson (now Lord Kelvin), Sir Benjamin Baker, Sir Frederick Bramwell, Gen. Strachey and Mr. R. Giffen. The committee selected its witnesses from practically all interests; but the chief incentive in so strongly urging reform seems to have been the effect of the prevailing incongruous system of weights and measures upon British commerce. Competent witnesses proved to the satisfaction of the committee that the change from the old to the metric system had been made in other countries without serious opposition or inconvenience and in a comparatively short time. It is also interesting to note that the committee voted down a proposition to postpone until 1900 the time proposed for the compulsory adoption of the metric system.

This committee differs from Mr. Wilkinson in believing that a fundamental change can be, and should be, made, within the comparatively short time of two years, in the whole awkward system of English weights and measures. It suggests no temporizing or modified metric system, but the adoption of that in use by all great European nations excepting Russia. This recommendation from a committee of the House of Commons is all the more remarkable when we consider the conservatism and disinclination to change accepted methods and standards which so strongly mark the English character. This is the second attempt on the part of England to introduce a fundamental change in standard weights and measures. The first was in 1862, when a committee of the House of Commons made the expediency of such a change a subject of inquiry. It failed in its primary object, but following that date the language of the metrical system was made legal in contracts, the equivalents of the metric system were recognized and the Standards Department of the Board of Trade took steps to verify metric standards and to increase the efficiency of the inspection of Imperial weights and measures by the local authorities. The Board of Trade also sanctioned the use of a cental of 100 lbs. avoirdupois, abolished the troy pound as a legal standard and provided a series of standard troy weights ranging from 1-1,000 troy oz. to 500 troy oz. Since 1862 the substitution of the metric system was twice proposed to the House, but both times defeated, though the original committee of 1862 did report in favor of a decimal coinage as a necessary preliminary to the adoption of a metric system of weights and measures. The question of a decimal coinage, strange to say, was not submitted to the present committee, though to those familiar with the difficulties incident to the use of "pounds, shillings and pence" it would seem to be one of the most awkward to deal with of all the prevailing English standards. While the committee deems the complicated and unsatisfactory condition of weights and measures a distinct and serious drawback to English commerce, especially in relation to foreign trade, it is somewhat singular that the system of money, upon which this commerce rests, should be ignored in the proposed simplification of weights and measures. This, however, may be accounted for by the fact that but few steps have been taken towards arranging a uniform system of coinage, and that nearly every country has still its own system. It is, therefore, perhaps wise to keep the unification of the system of weights and measures, in which considerable progress has been made, entirely separate from that of the system of coinage, in which much less progress has been made. This view was taken by some of the speakers in discussing Mr. Wilkinson's paper, above referred to, and it was the general opinion that while the use of the metric system in dealing with dimensions, etc., should be strongly advocated, this question should not be in any way mixed up with matters of finance.

One suggestion made in this official English report which is especially worthy of notice is the statement made by competent witnesses that not less than one year of school-time would be saved by the substitution of the simpler metric method for the present complicated system of English tables. The reason for this is simple enough: one system of weights and measures is founded upon a single unit with decimal multiples, easy to acquire and readily recalled at all times; the other is purely empirical, one table having little or no relation to the other; and there is a useless variety of standards of weight, volume and dimensions, and these several tables are only acquired by sheer exercise of memory, and only retained by constant use. If any one doubts this among English-speaking races, let him now attempt to repeat the many tables so painfully memorized and acquired in early youth. The committee is wise in recommending that the metrical system be taught in all public schools as a necessary and integral part of arithmetic, for that is the place to begin in introducing the new system. The present generation will undoubtedly have more or less trouble in breaking away from standards made familiar by many years of use; but even this has been done in many other countries, and can be done in England and in the United States.

The committee declined to adopt a proposed amendment, setting forth that no witnesses had been called to represent wholesale and retail traders, and other classes of the community and their customers, whose transactions in daily life would be disturbed by a compulsory abolition of the long familiar standards, and who had expressed no desire for a change. Had this expression of opinion been made the turning point of the new departure, it is safe to say that things would remain as they were in England, and in other English-speaking races as well. While the people of England and the United States are more accustomed to self-government, especially in matters affecting the small transactions of trade, than are the nations of the European continent, this question of adopting standards of weights and measures must be considered as one affecting the family of nations rather than the individuals of each nation. The trading world is now practically a unit, so far as its commercial transactions are concerned, and while England, the United States and Russia wield a powerful influence in this family of nations, the majority with which England especially has very close trade relations has adopted the metric system, and England certainly cannot long afford to maintain its present isolated position as to standards. Neither the United States nor Russia has quite the same commercial reasons for the change as has Great Britain, but our own country already has an important foreign trade, and is earnestly striving to develop it, and adaptation to the methods and demands of foreigners enters largely into this development. But aside from trade demands there are the questions of greater simplicity and public convenience, and on these scores alone there is no question of the advantages afforded by the decimal or metric system when contrasted with the complicated standards now in use among us. Our standards are a tradition of an old and past civilization—a survival only; and the time is now at hand to change them for those framed more in conformity with modern ideas and scientific progress. The conditions now demand one system of money, weights and measures for the whole civilized world, and this universal system must prevail in the near future, and decisive action by England would undoubtedly hasten this end.

The committee report here noted slightly errs in stating that the United States has lately made the metric system compulsory in pharmacy, the fact of the matter being that the U. S. Pharmacopoeia has been made exclusively metric. It is a slight distinction, but there is a difference.

LETTERS TO THE EDITOR.

ALINEMENT OF THE PANAMA CANAL.

Sir: In reply to the inquiry in your issue of July 18 as to the alinement of canals, I send you herewith notes of alinement of the Panama Canal as taken from an official map in my possession. The alinement is for a sea level project. Subsequent projects have slightly modified this alinement in details, but have not reduced the minimum radius of 2,500 meters (= approx. 8,200 ft.). As far as my information goes, excavation was not altered on account of curvature, although the water section varies in different portions of the line, being smallest at Culebra Cut, part of which is on a curve of 2,500-meter radius. Measurements are in feet, starting from Atlantic side. The total length of the canal from the Atlantic terminus to deep water in Panama Bay is 75,500 kilos (= approximately 47 miles).

Length of tang.	Length of curve.	Radius.	Length of tang.	Length of curve.	Radius.
1,935			14,005		
	4,034	13,120		7,347	8,200
16,465			7,052		
	7,216	9,840		1,377	9,840
3,083			3,837		
	3,149	13,120		5,117	8,200
8,659			2,033		
	9,151	9,840		3,181	8,200
10,463			4,887		
	8,856	11,480		2,361	8,200
2,886			3,739		
	6,297	9,840		2,230	8,200
3,283			1,540		
	8,593	9,840		3,050	9,840
6,986			13,972		
	11,841	9,840		6,429	11,480
3,870			8,823		
	5,576	9,840		8,823	11,480
2,230			17,515		
	5,740	9,840			

Total length of tangent,.....137,263 ft.
" " " curves.....110,368 "

Grand total .....247,631 ft.
= 46.8 miles. Curves = 44% of line.

Yours truly, W. F. Dennis,
M. Am. Soc. C. E.

Richmond, Va., July 21, 1895.

JOINTS FOR RIVETED STEEL WATER CONDUITS.

Sir: The communication in your issue of June 27 on the "New Whatcom, Wash., Water Pipe Failure," in which the cemented joints of the riveted sheet steel pipe, made of No. 18 sheets, proved defective, suggests a better system. The manufacturers have devised various modifications of "band joints" for this pipe, though, from my observation, the most simple, economical and thoroughly efficient plan for joining the sections of sheet piping is the method employed in the early mining practice of California, and still extensively used for irrigation and the distributing pipes of town supplies. The pipe is first coated with pitch by submerging it in a vat of hot "brea," which is the native California asphaltum. The ends are double coated inside and outside, and are made to telescope as in a stove pipe. The sections of pipe are driven together from the unjoined end by placing a wooden plug and cover over the end of the pipe, driving the section home with a maul, at the same time applying a flame of pitch or kerosene torch to and around the joint, thoroughly softening and cementing the two "brea" coatings. This is very rapidly done. Before back-filling the pipe should be tested under pressure, which has the effect of closing the joints, especially when aided by a few hammer blows. Care should be taken to have all scratched places recoated with "brea."

In practice this is a perfect success. I have seen in Los Angeles a pipe of No. 20 iron which was laid on this plan over thirty years ago, exhumed for a distance of 80 ft. by street excavation. After all these years of satisfactory service it apparently was as good as the day it was laid.

This is an old method, devised in a country far away from easy means of transportation, and good whenever required. In southern California in 1888 the No. 16 sheet metal riveted pipe of local manufacture cost 24, 35 and 49 cts. per lin. ft. for 4, 8, and 16 ins. in diameter, respectively. After the pipe was distributed on the ground it cost 1 ct. per lin. ft. to lay; three men could lay 1,000 ft. per day. Curves laid to 150-ft. radius were braced in position and stood pressures up to 500 ft. head in perfect shape. Sincerely,

Isaac Leskard.

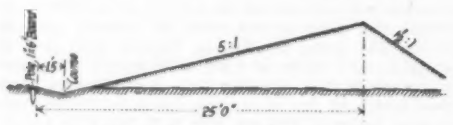
University Park, Ore., June 29, 1895.

BICYCLE RACE TRACKS.

Sir: I am greatly interested in the discussion of the dimensions for race tracks now being carried on in your columns. The increasing interest in bicycle racing has created a demand for race tracks designed especially for bicycle racing, but no movement has as yet been started for the adoption of standard dimensions, and there seems to be even a greater diversity of form in bicycle tracks than in trotting tracks.

I think it would be a matter of special interest to hundreds of the younger members of the profession if some of the engineers who in course of their experience have had occasion to study on this or similar questions, would clearly define the difference in the effect of centrifugal force upon the sulky and the bicycle at speeds from 25 to 30 miles per hour, and give a formula for the proper angle of inclination of the surface of the embankments on the turns on bicycle tracks, in terms of the velocity and the radius.

Last year I was called upon to design and construct a quarter-mile bicycle track for a local bicycle club. No time was given me to gather data from outside sources, so I was obliged to rely upon my own judgment entirely. After a hurried consideration of the principles involved, and the conditions governing this individual case, I decided upon the following dimensions: Tangents, 300 ft., and curves, 361.285 ft., making the radius of the "pole" 113.5 ft. This allows for an excess* of 2.57 ft. in the length of the course, measured 1.5 ft. from the pole. The track is 25 ft. wide all around. For the transverse slopes of the embankments I decided upon 1 in 25 on the stretches, 1 in 8½ at the P. C's. and P. T's. (toes of slopes are on the stretches, 50 ft. from P. C's. and P. T's.), and from the middle of the "turns" to within 25 ft. of the P. C's. and P. T's., 1 in 5. The accompanying figure shows a cross-section at middle of turns.



Cross-Section of Bicycle Track at Curve.

The P. T's. are 1 ft. higher than the P. C's., thus making a down grade of 1 in 300 on the stretches, and an up grade of 1 in 360 on the "turns." A reference to the figure will readily show the necessity for this, for the purpose of draining the turns.

The use of fences to mark the pole on the turns on bicycle tracks is, in my estimation, a dangerous practice, and I have been gratified on several occasions to see that dangerous accidents have been avoided on this track by turning the wheel quickly, and riding over the pole, thus avoiding a fall that, with the fence system, must have resulted in a "smash up," attended by dire consequences for all that followed closely in the rear.

Very truly yours, A. C. Koenig.

Grand Island, Neb., July 8, 1895.

SEWAGE PURIFICATION AT MERIDEN, CONN.

Sir: Referring to the article and editorial note in your issue of July 18 on sewage purification at Meriden, I desire to say a few words regarding the area of land graded for filter beds and irrigation purposes, and the matter of underdrains.

The plans and estimates for the Meriden work, as prepared by Mr. S. C. Heald and myself, and as adopted by the city meeting and approved by the State Board of Health, called for the preparation of about 50 acres of land for immediate use. It was our intention to remove the surface soil on the filter beds to a depth varying from 2 to 3 ft., using the soil in the embankments carrying the distributing pipes. For summer use the ground was to be prepared by the ridge and furrow system.

Test pits were dug to determine the nature of the subsoil and height of ground water. We found the subsoil at the usual depth for laying underdrains to be a very coarse and loose gravel. The probabilities were that no water would find its way into the underdrains, and therefore we did not recommend them. Subsequent results have proved the wisdom of this recommendation, as those who have watched the drains closely have never seen any water running from them, although the beds have been dosed to ten times their capacity. Th underdrainage is intercepted at a depth of from 14 to 18 ft. by a bed of impervious blue clay, and appears in the form of springs near the river banks.

Mr. C. Ph. Bassett, who acted as consulting engineer during the construction of the works, approved of the plans as recommended by Mr. Heald and myself. He did not, however, enforce the construction of a sufficient number of filter beds, and for the past few months the sewage of 12,000 people has been poured onto about four acres of filtering surface. The result is that the beds have become clogged by the formation of an impervious layer of sludge, which, when uncovered, has been the source of odors which have been complained of by the surrounding inhabitants, and which the newspapers have attributed to the methods of treatment, rather than to the lack of any method.

These beds have received the sewage from 3,000 or 4,000 people per acre, although they were not intended to receive the sewage from more than 300 or 400 per acre.

I believe that the blame for failure to prepare sufficient filtering area lies with the city officials rather than with Mr. Bassett, as his opinions, expressed both verbally and in his published report, regarding the population and volume of sewage per acre agree with Mr. Heald and myself.

The city is now working in the right line by preparing an additional area of eight acres of filter beds. It should, however, double the area, as the old beds are so thoroughly clogged as to be unserviceable.

Very truly yours, T. H. McKenzie.

Southington, Conn., July 21, 1895.

(The above agrees in the main with the criticisms made in our issue of July 18. It was stated there, however, that after Messrs. McKenzie and Heald submitted their reports, and Mr. Bassett approved their recommendations with some amendments, the latter was engaged to prepare plans and specifications for the sewerage and sewage disposal systems. Mr. Bassett performed this service and acted as consulting engineer during construction, as may be seen by referring to the municipal reports of the city of Meriden.—Ed.)

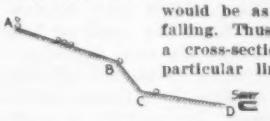
THE INFLUENCE OF SLOPE ON RUN-OFF FROM DRAINAGE AREAS.

Sir: In this city (Philadelphia) there was recently held a civil service examination for the position of district surveyor. Among the problems proposed were the following:

Given 50 acres of farmland, 100 acres of woodland and 8 miles of paved streets 50 ft. wide, with an average slope of 3 ft. per 100 ft. for all; with 1 in. rainfall per hour, what would be the discharge from the district?

Sketch a cross-section of a sewer to carry off this water, giving dimensions; sewer to have a fall of 1 ft. in 500 ft.

In discussing this question with other candidates, and in looking up the subject, I find that considerable importance is attached to the slope of the ground. So far as the answer to this particular question, this seems to me to be of but little account. In designing a sewer the engineer must consider the maximum amount of rainfall to be carried off. Of course, during the first hour the amount of water reaching the sewer would depend on the slope, but after the drop from the most remote section reaches it, the flow would be as fast as the rain was falling. Thus, suppose A B C D to be a cross-section of surface on any particular line. Suppose it to be of such length, and other conditions to be such that a drop falling at A would be one hour in reaching the sewer at D. Then the amount of water reaching D in the first hour would be about one-half of the total fall, less the amount absorbed.



The second hour, however, would be different. Suppose, again, the rate of rainfall is one drop per second. Then a second drop falling at A would be one hour and one second in reaching D, as it will, on the average, travel with the same speed as the first drop. Thus, the whole 3,600 drops falling at A in one hour will, under these circumstances, reach the sewer during the course of the second dour, less, of course, the drops absorbed. The only possibility of the grade affecting the matter lies in the fact that more water will be absorbed at a low velocity than at a high one. The writer presumes, however, that, for purposes of figuring maximum discharges, this would be of but little value, except on extremely flat or extremely steep lands.

There are about 30 of us here who are, or ought to be, interested in this "the star problem of the exam.," and I hope you will insert this, with your comment thereon, and perhaps open the field for further discussion and light. Yours, etc., District Surveyor.

Philadelphia, June 9, 1895.

(The confusion on the above subject seems to lie largely in failing to recognize that rainfall is not uniform hour after hour, and that sewers are not built on that basis. The rate of rainfall assumed in the problem, 1 in. per hour, indicates that a very heavy shower and not a long-continued rain was contemplated. It is not the steady rainfall extending over long periods which cause the maximum flow from a given small area; but the sudden bursts of rapid rainfall for which it is in some cases impracticable to fully provide. Under such circumstances slope and velocity are very important factors. In large drainage districts a rain which will severely tax the sewers may be over before the flow from a considerable portion of the area arrives, especially if the slope is small. Obviously if the slope be great a larger portion of the precipitation will reach the sewer during the shower. It not infrequently happens that the rate of rainfall suddenly increases after a long-continued, steady rain, which may have filled the sewers nearly or quite full. Here again slope plays an important part.

Our correspondent is not very specific in his references to the effect of slope upon the degree of absorption, but he seems to belittle this, and makes no reference to the evaporation. In woodlond, especially, which plays an important part in the problem, slope would be a great factor in the amount of absorption during short, heavy rains, and in all classes of level or nearly level land, but notably open land, with a clayey soil, the amount of loss by evaporation would also be largely affected.—Ed.)

THE ELASTIC LIMIT AND THE YIELD-POINT.

Sir: Your very complete discussion on the elastic limit and the yield-point has been read with interest. It seems to the writer, however, that much is, at the present time, being written on this subject which practical engineers will not take the trouble to read. We all know what the elastic limit is, and there is in reality no difference of opinion whatever on the subject so far as the theoretical meaning of the term is concerned. We all know that the drop of a beam indicates that the stretch has passed that point at which the elongation is no longer in proportion to the force applied. It has been the common custom in this country, at least for quite a number of years, to consider that the dropping of the beam represents the elastic limit closely enough for all practical engineering purposes, and when engineers use the term "elastic limit" in their specifications, they use it with the understanding that it will be arrived at without the use of microscopes or micrometers. The yield-point has really no theoretical value whatever, all calculations being based upon the elastic limit. It would therefore be rather absurd for any engineer to specify "yield-points" instead of "elastic limits." No practical man will care whether or not the drop in a beam indicates a stress of 5 or 10% higher than the actual elastic limit, because it still represents the latter approximately. Respectfully, J. G. Greiner,

Engineer of Bridges, B. & O. R. R.

Baltimore, Md., July 27, 1895.

(We think that practical engineers will be well repaid by taking some trouble to read what we have recently published on the elastic limit. If it is true that the elastic limit of a piece of steel may be varied some 3,000 lbs., or even more, merely by the way the test is made and the personal equation of the operator, the fact is worth some attention in view of the tendency in recent years to consider the elastic limit of metal as a more important figure than the ultimate strength.

In this connection we may say that the first part of Mr. Cunningham's letter, on the first column of p. 60, in our issue of July 4, was robbed of much of its force by a printer's blunder. We reprint it herewith, therefore, in correct order.—Ed.)

In 1887, at one of the prominent mills of Pittsburg, the hand wheel was still used for producing the slow motion which determined the elastic limit, and continued to be used for some time thereafter. When increasing requirements caused this mill to purchase a modern testing machine, in which the slow elastic limit motion was produced by power instead of by hand, the old and new machines were used alongside of each other for a considerable time, without any noticeable difference in the elastic limits being observed.

In Pittsburg and vicinity at this same time there were several testing machines so sluggish and inert that it was only by the use of the dividers that any elastic limit could be determined. The use of the dividers is not yet obsolete—in fact, they are used in almost every testing room to check doubtful cases, and hand wheels and pumps on testing machines may still be found.

I do not think we have forgotten or lost anything that was of value in the older methods of testing; increased accuracy and sensitiveness in modern testing machines, as well as cumulative experience, have, how-

* I have since found by a series of tests with cyclometers of different patterns that this excess is too large.

ever, rendered some of the former practices unnecessary. The statement that the elastic limits obtained by the older methods were as near the true elastic limits as could be obtained might have safely included also that they were as high as could then be obtained.

I should be as well pleased as Mr. Webster if our manufacturers would give us their opinion of "go-as-you-please" testing, and at the same time an opinion of "commercial inspection," which has done much to foster this kind of testing. Regarding Mr. Webster's statements: He has been wrongly informed about Mr. Geo. H. Thomson having modified his elastic limit to 34,000 lbs. in his specification. His statement that Messrs. Cunningham and Stowell have been instructed by Mr. Thomson to accept material as low in elastic limit as 34,000 lbs. is also, unfortunately, in error. We have received instructions to use our judgment about accepting material which differed slightly from specified requirements, or in cases which we deemed worthy of consideration to refer the same to Mr. Thomson. The reports partially reproduced by Mr. Webster come under these heads.

I cannot understand why the Pottstown Iron Co. should refer Mr. Thomson's specifications to Mr. Webster with a view to bidding on material made under them. The specification definitely calls for acid open-hearth steel, and further requires that the steel shall be made by the same mill that rolls it; these conditions, I think, effectually bar the Pottstown Iron Co., and suggestions for modifications would hardly be in order from them. In Mr. Webster's close watch upon the workings of Mr. Thomson's specifications, I judge, from some of his statements, that he has an entirely independent and separate case mixed up with it. He may be pardoned for this confusion, however, as we (Stowell and Cunningham) have been connected with both cases, which are somewhat similar.

LINES OF MAXIMUM SHEAR IN BEAMS.

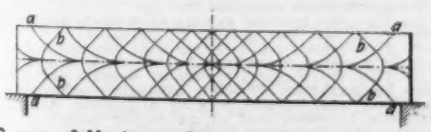
Sir: Having been interested in a study of the theory of internal stress in beams, the writer would like to offer the following remarks. For the benefit of those who are not acquainted with the theory, it may be mentioned that a full and complete solution may be found in Merriman's "Mechanics of Materials." The principle of the proof is to consider any element of the beam as acted upon by the vertical and horizontal shears, and the horizontal tension or compression, and by calculus find in what direction the resolution of forces will make the required tension, compression or shear a maximum. With the exception of the trigonometrical reductions there is nothing difficult in the problem. The theory does not of course take into account the direct stress due to the load, simply assuming the beam to be acted upon by bending moment and shear. The neglect of this direct stress is necessary in any general treatment of the problem, because every change of load would vary the formulas. This neglect is not serious, however, since the effect is small.

Omitting the familiar curves of maximum tension and compression, respectively convex downwards and upwards, about which there is nothing abnormal, attention is directed to the curves of maximum shear. The formulas are:

$$\tan 2\,\phi = \frac{p}{2\,v} \qquad (1)$$

$$s = \pm\tfrac{1}{2}\sqrt{v^2 + \tfrac{1}{4}\,p^2} \qquad (2)$$

in which ϕ is the angle with the horizontal made by the direction of resolution of forces, p is the direct horizontal tension or compression, positive for tension and negative for compression, and v is the horizontal shear. At any point the horizontal and vertical shears are equal. Since on any horizontal plane p increases and v decreases as we approach the middle of the beam, the value of $\frac{p}{2\,v}$ becomes greater as the middle is approached. Again v is a maximum on the neutral surface, and zero at the upper and lower surfaces, while p is a maximum at the upper and lower surfaces and zero at the neutral surface. If now we use (1) to plot the curves of maximum shear, the result will be two sets of curves at right angles, the two shears at any point being equal and of opposite character. (a) and (b) in the accompanying sketch are types of the two curves. Curves (a) cut the upper and lower surfaces at 45°, and become horizontal at the neutral surface, while curves (b) cut the upper and lower surfaces



Curves of Maximum Shearing Stress in a Beam Subjected to Flexure.

at 45°, and become vertical at the neutral surface. Now it is to this second set of curves (b) that attention is called. In the various treatises to which the writer has had access there is no mention made of these curves, and the queston is, why? Both from mechanical and mathematical considerations their existence seems assured, and yet the different authorities do not mention them; and further, it is said that the phenomena of rupture would indicate in the majority of cases only the curves (a). The question raised is, whether it is really true that the curves (b) are not indicated by experiment; and if they are not, whether there may not be some physical cause making curves (a) more marked. It must be borne in mind that in the theory the elastic limit is supposed not to be exceeded, and therefore the stress on curves (b) might really exist, and yet not be effective when actual rupture occurred.

In using (1) to plot the curves of maximum shear, the change of sign of p and v must be taken into account, and also the variation in the value of $\frac{p}{2\,v}$. The effect of this is to make one set of curves shade insensibly into the other, the change in direction at the neutral surface from horizontal to vertical, or vice versa, occurring at the center of the beam where from (2) the value of s is zero. Curves (a) become steeper and straighter as the middle of the beam is approached, and cross the middle section at 45°. Curves (b) are at right angles to these. The accompanying sketch shows them for the whole beam, and the question is asked, are these the true curves of maximum shearing stress?

Media, Pa., July 3, 1895. C. M. B.

(We referred our correspondent's query to Prof. Merriman and append his reply as follows:—Ed.)

Sir: The lines of maximum shearing stress shown in the figure seem to be correct, for certainly a shear at any point in the beam requires another equal shear at right angles to produce equilibrium. I am unable to state why it is that only the curves marked (a) are drawn in the text-books, unless the existence of the other set is tacitly implied. With regard to experiments, it may be said that these generally show the lines of maximum tension and compression rather than those of maximum shear. In the phenomena of rupture it is not expected, as your correspondent points out, that the surfaces along which shearing occurs should agree with those deduced under the assumption of perfect elasticity. Yet the rupture of beams by shearing under impact sometimes gives a rough approximation to the (a) curves in the lower part of the beam, and occasionally to the (b) curves in the upper part. In the "Transactions of the American Society of Civil Engineers" for 1875 will be found an interesting record of experiments on glass beams under polarized light, by Louis Nickerson. Although these experiments do not directly help to answer the questions raised by your correspondent, they may be noted as work of much value, and similar work might profitably be undertaken in technical schools, in order to arrive at the complete solution of many problems of internal stress. Mansfield Merriman.

South Bethlehem, Pa., July 10, 1895.

ROUTES FOR THE NICARAGUA CANAL.

Sir: I do not think you can have studied very carefully the plans of the Menocal location for the Nicaragua Canal before writing your editorial comments on my letter in your issue of June 20. You must, of course, know that the Colorado River is an effluent from the San Juan, and, therefore, has nothing whatever to do with the drainage problem between the Ochoa dam and the Sarapiqui River. It is, in fact, the San Juan proper, the branch to Greytown being very insignificant in comparison. The Sarapiqui is, therefore, as you will see, the only river running into the San Juan on the south bank, the San Carlos being already included in the Menocal location above the dam. Against this one river, the Sarapiqui, you have, on the north, the San Francisco, and another, once called the Rio Peary, running out of Florida lagoon, between Ochoa dam and the great Divide. Then, on the other side of the divide, you have the Deseado, the Rio Negro and the San Juanillo, of great importance, to say nothing of the whole watershed and lagoons between the Great Indian River and the lower San Juanillo. The upper end of the San Juanillo, though it connects with the San Juan, is not, in the same sense as the Sarapiqui, an affluent from it, being a mere rivulet about 10 ft. wide at the point where it meets it. If, therefore, the question of drainage is so important that you would not even make a survey on the south bank of the San Juan, where it is palpably as easy to get a location very close to the crest of the much smaller watershed of the Sarapiqui, if found necessary, what do you think of the watershed on the north side outlined above? What reason can there be assigned against such a survey that would have for its object the elimination of the great divide cut and the long line of dams and embankments from Ochoa dam to the Deseado dam, built of loose rock and earth to retain the water 70 ft. above the flat lands between the San Juan and the San Francisco? It is easy to pass over items of rock-fill dams, etc., in an estimate, even though the figures are stated, without really conceiving their import, until attention is drawn to them by those who, from actual observation on the ground, are accustomed to see the effects of floods in these tropical rivers. I frankly say that many of the items in Mr. Menocal's proposition fairly take my breath away. Their boldness and apparent simplicity, coupled with the total absence of all precedent, will undoubtedly be admirable, if eventually successful, but can you give me a single instance of any such rock-fill structures anywhere, but more especially in the great rain belt of the world? I am perfectly aware that the latest published plans of the canal company provide for a width of 100 ft. and a depth of 30 ft. through the great rock cuts. But those figures were never used in the Menocal estimate (I helped in the computations, and you can refer to the original published plans). The change was an afterthought, when the absurdity of the dimensions was shown by myself and others (see my letter in your issue of July 6, 1893, in reference to the San Blas route), but the figures remained the same, "$65,000,000, increased to $100,000,000 by consulting engineers for safety." Will you just think for a moment what such a change of dimensions means over 8 miles length on the Western Divide cut; two feet increased depth and 20 ft. more in width through such cuts; the same difference in the excavations from a point 14 miles within the lake to a point nearly 30 miles below Fort San Carlos, and the same all through the other heavy cuts between the Ochoa dam—and then the Divide? A very great part of this blasting would be under water. Have you considered the further possibility of our not being able to keep the lake at the adopted elevation of 110 ft. above sea level in its effect on the estimates? I personally do not believe it can ever be retained continuously above 106, with the degree of certainty necessary for navigation. (Obtain, if you can, the actual levels taken on the survey.)

The Ochoa dam crest is fixed by the Menocal location at 106 ft. above sea level. It is 65 miles from the lake. Will it retain the lake at 110 ft. at such a distance away from it (a lake 150 miles long by 50 wide, to be raised 4 ft., and maintained there by such a device). Consider all the lagoons between there to receive the flood waters and spread them out over an unknown, unsurveyed, but evidently enormous, area, in a country full of topographical "surprises," and giving irregular flood levels at different points of its length. I am speaking here from actual observation, not only of the San Juan, but of the Magdalena, Atrato, and many other similar large rivers in these latitudes.

You are quite right in regarding the drainage question as the all-important one in Nicaragua, but you are quite wrong if you believe it has been dealt with in the Menocal location as it should be. The above points are only a few of the many serious objections I have to the adopted surveys, but I think they are enough for the present to convince you that I do not speak wildly when I say that the estimates so far made are grossly wrong. I am perfectly familiar with the whole subject, am deeply interested in it as the greatest engineering achievement left for man to accomplish, and I know whereof I speak. At the proper time I am fully ready to prove my points, and am not influenced by any motive of destruction or animosity. I am not trying to demolish what I cannot or do not want to build up again, as I am positively convinced that I can outline a perfectly reasonable location from actual observation on the ground that eliminates most, if not all, the objections I have to Mr. Menocal's plans. I also state most positively my belief that the Nicaragua Canal is the only one that ought to be attempted across the Isthmus, as it is not at all as difficult a problem there as elsewhere. My line does not pretend to be wholly original, though, as far as I know, there are one or two very important features in it, not hitherto proposed. Further, that I am convinced that neither my line, nor Mr. Menocal's, nor any other, will ever be built for $100,000,000, and it is positively criminal, after what has occurred at Panama, to attempt the construction of a canal at Nicaragua without complete surveys on both sides of the San Juan River down to the sea.

I wish no harm to, and cast no reproach upon Mr. Menocal, a very able man, who has my highest respect, for his enthusiasm and work for the canal interests are beyond praise. I believe him to be honestly mistaken. My enthusiasm is quite as intense as his, but I plead for caution and a fair survey, and I feel fully able to enforce it. I can prove too many inaccuracies and absurdities in the work so far done to quietly let them stand without protest. I shall do all that is necessary later, and trust that your sense of duty to the public will enable you to give me credit for the same feelings which I am sure actuate yourself in this matter, whether my views are in accordance with your own or not.

Of the political bearing of the whole question I can also speak with certainty and authority, but your paper is not the place for that part of the discussion. I advise you, however, not to trust to any "abridged" history of all the concessions that have hitherto been granted for the work, in none of which am I, or have

I ever been, in any way personally interested, except in so far as to study carefully their validity, with a view to advising intending investors when I have been consulted professionally. I am, yours very truly,

J. T. Ford.

Assoc. M. Inst. C. E., Chief Engr. & Supt. C.-M. R. R.
Cartagena, July 4, 1895.

(Mr. Ford makes a stronger plea for further surveys than in his previous letter, though we are not yet convinced as to the relative areas of the north and south watersheds of the San Juan River, nor as to the difficulties he sees in maintaining the level of Lake Nicaragua. But the subject is an interesting and very important one, and believing that Mr. Ford has only the same sincere desire to see the best location made that actuates ourselves, we publish his letter in full. In view of the forthcoming report of the Canal Commission, which has so lately studied this question of location and construction, we withhold any further comment at this time. But we fully agree with Mr. Ford, as we have not long since stated, that further and most exhaustive study of the whole country east of Ochoa is needed before final plans and any really safe estimates of cost can be submitted to the public.—Ed.)

NOTES AND QUERIES.

J. H. H. asks information about the transmission of 1,500 HP. by manila rope or wire rope, speed 3,000 feet per minute, distance between pulleys, 40 ft. He will be glad to learn if any of our readers has had experience with a transmission under these conditions. For such a short distance between pulleys it would seem that manila rope would be more suitable than wire. The speed of 3,000 ft. per minute is lower than that which is usually taken as the most economical speed—viz., 5,000 ft. per minute. For this speed, 30 manila ropes, 1¾ in. diameter would be required, running over pulleys 6 ft. in diam.

THE METRIC-DECIMAL SYSTEM OF WEIGHTS AND MEASURES.

One of the subjects considered at the recent International Railway Congress was that of the general adoption of the decimal system in calculations relating to the construction and working of railways, and the methods of facilitating the introduction of the metric system of weights and measures in those countries where it is not already in use. A report on this general subject was presented by Mr. J. L. Wilkinson, Chief Freight Manager of the Great Western Ry., who considered that the adoption of the metric-decimal system by the English nation would not only be of great service in railway work, but also in internal and international commerce. The whole of the civilized countries of the world, except Great Britain and certain important British colonies and dependencies, have introduced the decimal system in some shape or form, but the British system has met the requirements of a vast domestic and foreign commerce for many years, and there are many obstacles to the introduction of a new system. Legislation has been frequently introduced for the purpose of inducing uniformity in the standards, but mainly in regard to internal or home requirements, it being left largely to the traders interested in business with other countries to acquire the necessary knowledge of foreign standards of calculation. Although the principles under which English commerce had been generally conducted were codified by the government in 1758, there continued in use a number of local and "customary" measures and weights, some of which still remain in spite of frequent subsequent legislation. The English system having been built up in this way is naturally complicated, has little relationship with the practice of other countries, and has no scientific connection between its own units. The same remarks may be made as to the system in use in this country, as pointed out in our issue of Aug. 2, 1894, but we have here a decimal coinage. We have published numerous articles on this subject, and some of the principal of these will be found in the issues noted below.*

The following is an abstract of that part of the report which refers to the metric system:

* Dec. 22, 1892; July 13, Aug. 31 and Nov. 9, 1893; March 1, April 5 and Aug. 2, 1894; Jan. 3 and May 30, 1895.

The metric system was devised in the closing years of the last century. The French nation was desirous of obtaining one uniform system of weights and measures throughout the country, and in the year 1789 it was determined to open up communication with other countries, and to invite their co-operation with the object of bringing into force a system of weights and measures suitable for universal adoption by all nations. England especially was requested to take part in the proceedings, but did not accept the invitation. An international commission of continental scientists was formed, and this commission fixed upon the meter as being the unit of length upon which to base the new system. The meter, which is equal to 3 ft. 3.3708 ins. in English measurement, was at that time represented as being a ten-millionth part of the distance from the equator to the north pole.

The metric decimal system thus formed was approved by the French government in the year 1790, but from various causes, partly political and partly educational, it did not become operative until 1837, when a law was passed declaring it thenceforward to be illegal to use any other mode of dealing with weights and measures. There had previously been great diversity and confusion in the various provinces and governments into which the country had been subdivided, and the new system appears to have been received throughout the land without opposition, and to have taken the place of varying previous methods, not only for the whole of the foreign trade of the country, but also for nearly all of the domestic trade (it being understood that in certain districts there are still a limited number of local customs kept up, chiefly in connection with local business).

Assuming that the English people determined to make a change in connection with their weights, measures, and coinage, it is evident there are various methods, other than by adopting the metric system, by means of which a decimal system could be originated. In the United States of America, for example, the money calculations are made upon a dollar of 100 cts., and the weights by means of a ton of 2,000 lbs.;* in Germany, the money transactions are made by the reichmark of 100 pfennigs; in Russia, by the rouble of 100 kopecks; and in Ceylon they are made by a decimal subsidiary currency based upon the rupee. Probably, however, if any great alteration were made in the British practice, the nation would, for many reasons, prefer to adopt the metric decimal system, possibly in its entirety.

But while recognizing the distinct superiority of the metric system over every other method in use, it is not easy to indicate the machinery by which the existing British practice could be replaced by something new. The English are peculiarly tenacious of old customs and of what they regard to be their rights, and a very large numerical proportion of them would regard with distrust and suspicion, and would give their strongest opposition to, an attempt to abolish a state of things which has stood the test of the usage of centuries, and upon which the commerce of the country has been built up. The British Parliament, moreover, has deeply rooted objection to using the strong hand in connection with changes of the kind that would be necessarily incidental to its general introduction, and no English government has yet cared to face the question in earnest.

In 1862 an exhaustive inquiry was made by a select committee on weights and measures, appointed by the House of Commons, but the labors of the committee ended by a recommendation that the use of the metric system should be rendered legal, but that no compulsory measures should be resorted to until the proposed changes had been sanctioned by the general conviction of the public, and the introduction of a silver coin representing the tenth of a pound sterling together with the passing of an Act of Parliament in 1864, rendering permissive the use of the metric system, appeared to promise an installment of it. It remains a significant fact, however, that although in recent years the question has been kept prominently before the public by means of an association formed for the purpose, and especially before the trading public through the machinery of the various chambers of commerce throughout the country, it has apparently not been possible up to the present time to enlist any substantial amount of practical interest upon the part of the great bulk of the people, and in particular the efforts have failed to excite sympathy on the part of the smaller traders and from the less informed classes.

The writer has frequently met with the objection that decimals are not easy to learn, but to this he entirely dissents. It has been a portion of his own experience to organize and open up for traffic a line of railway in a country in which the metric system was in operation, and he found no difficulty in immediately conducting the whole of the calculations relating to the construction and working, and generally in dealing with the business of the line, upon that system.

In fact, so simple is the working of the metric decimal system as compared with the intricate English system that it has been authoritatively estimated that every English child could save at least a year from the time devoted to learning arithmetic if it were relieved of the obligation to conquer the intricacies and mysteries of the various weights and measures tables.

As a matter of fact, so far as regards weights and measures, an Englishman engaged in railway work will have conquered the principal difficulties of the metric system when he has recognized the facts that a meter is about equal to 3 ft. 3 ins., while a kilometer is about five-eighths of a mile, and that a kilogramme is about 2 1-5 lbs., and that 1,000 kilos practically represent a ton.

As to the possibility of the English railways permissively adopting the decimal system in their daily dealings with their customers, and applying it to the existing coinage, weights and measures, without waiting for further legislation, the writer is strongly of opinion that such a step could not be taken at the present time. The government itself has not found it expedient to adopt such a course in its commercial transactions, and for the railways to attempt to pioneer such a change while the national and legal system remain unaltered would not only expose them to suspicion and opposition, but would result in confusion. For a long time past, however, English railways, in common with the larger assurance companies, bankers, and others making intricate calculations, and requiring results and records that admit of a ready comparison, have largely had recourse to decimals, and the decimal methods of calculation are rapidly becoming much more familiar throughout the country.

As a matter of special importance in connection with Mr. Wilkinson's paper advocating the introduction of the metric system, we give below the report of a Select Committee of the House of Commons, appointed to inquire whether any changes in the present system of British weights and measures should be adopted, and this seems to dispose of some of the objections alluded to in the last paragraph of the foregoing abstract:

The Select Committee appointed to inquire whether any and what changes in the present system of weigths and measures should be adopted, have considered the matters to them referred, and have agreed to the following report:

They have in the first place received evidence from witnesses representing many different interests, (1) official; (2) commercial; (3) manufacturing; (4) trade; (5) educational; (6) professional.

They have also received from numerous corporations, school boards and other public bodies, resolutions without exception in favor of the adoption of the metrical system.

Your committee find that almost all the witnesses express a strong opinion as to the complicated and unsatisfactory condition of our present weights and measures, and of the distinct and serious drawback to our commerce, especially our foreign trade, which this system entails, differing as it does from the system (metrical) now adopted by every European nation except ourselves and Russia, as well as by far the majority of non-European countries with which this kingdom trades. The evidence, however, goes further to show that not only is our foreign trade in every branch seriously handicapped, but that the home trade would be benefited if more simple and uniform standards of weights and measures than those now existing were adopted.

Moreover strong evidence was brought forward as to the serious loss of time incurred by English school children in having to learn the complicated system of tables of existing weights and measures, and the urgent need of the adoption of a simpler system. It was stated that no less than one year's school time would be saved if the metrical system were taught in place of that now in use.

Evidence from competent witnesses proved to the satisfaction of your committee that a cumpulsory change from an old and complicated system to the metrical had taken place in Germany, Norway, and Sweden, Switzerland, Italy, and many other European countries without serious opposition or inconvenience. That this change was carried out in a comparatively short period, and that as soon as the simple character of the new system was understood, it was appreciated by all classes of the population, and no attempt to use the old units or to return to the old system was made.

In the United States, where a system founded on the English units exists, a commission is at present engaged in an investigation of the same character as that with which your committee is charged, and the federal government has this year passed an act rendering the metrical system compulsory for pharmaceutical purposes.

Your committee believes that the adoption of the metrical system by England would greatly tend to render that system universal.

Your committee recommend:

(a) That the metrical system of weights and measures be at once legalized for all purposes.

(b) That after a lapse of two years the metrical system be rendered compulsory by Act of Parliament.

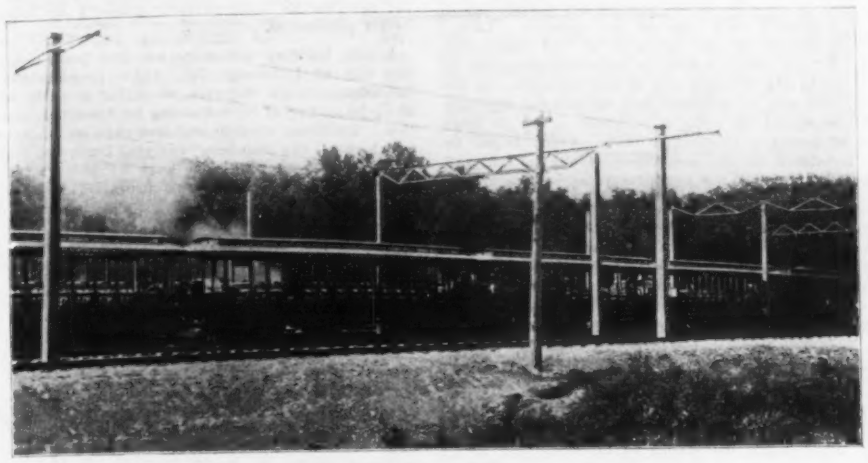
(c) That the metrical system of weights and measures be taught in all public elementary schools as a necessary and integral part of arithmetic, and that decimals be introduced at an earlier period of the school curriculum than is the case at present.

* Eng. News, May 30, 1895.

The creosoting works of the Louisville & Nashville R. R., at West Pascagoula, Miss., are to be remodeled. Two new treating cylinders will be put in, each 6 ft. in diameter and 130 ft. long, with pumps, boilers, superheater, etc. This plant is used chiefly for treating piles.

ELECTRIC TRACTION ON THE NANTASKET BEACH RAILWAY.

It has for some time been understood that steam traction is an expensive system of operation for short branch lines, requiring frequent trains to accommodate passenger traffic, and two of the leading railways are now experimenting with electric traction for such lines. The New York, New Haven & Hartford R. R. is now operating by electricity its Nantasket Beach branch, which has a heavy summer traffic and light winter traffic; and the Pennsylvania R. R. is also operating in the same way its Burlington & Mount Holly branch, six miles long. Mention may also be made of the Brooklyn & West End Ry., a summer and suburban line at Brooklyn, N. Y., on which also the trolley system has been substituted for steam locomotives.



AN EXPRESS TRAIN ON THE NANTASKET BEACH RY.

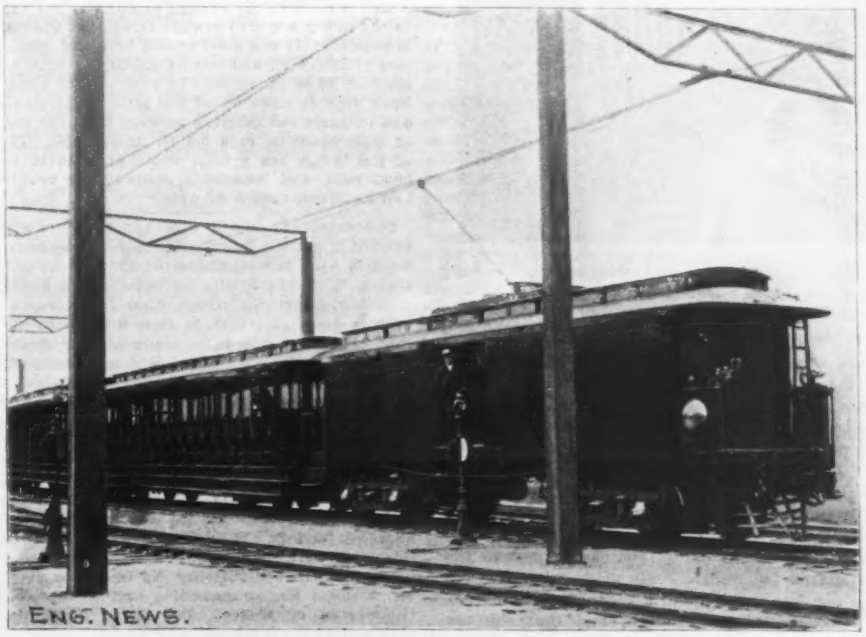
The change from steam locomotives to electric motors on the Nantasket Beach branch has attracted much attention from a popular and technical point of view, and we have already published considerable information respecting this line. We present herewith some further particulars, and some views of the road and its rolling stock, for which we are indebted to the General Electric Co., which furnished the equipment. The length of the branch over which electric motors are operated is 6.91 miles, and there are about 20 curves aggregating four miles in length, the sharpest curve being 10°. As the line follows the beach it is practically level, with a short grade of 34 ft. per mile near the junction with the main line. There are 10 stations at present, but others are to be built as required, there being numerous summer resorts along the route. The engineering features include two trestles, a plate girder bridge and a heavy retaining wall, and also a sea wall about ¾ mile long, this latter wall being 8 to 15 ft. high and 10 to 15 ft. thick, and having the tracks laid upon its top.

There is a double track throughout, the tracks being 15 ft. c. to c., laid with 70-lb. rails on ties spaced about 2,800 or 3,000 per mile, on stone ballast. Each rail joint is bonded with a flexible No. 0000 wire stranded copper bond, 7 ins. long, each end having a copper stud, which is riveted into a countersunk hole in the rail flange. Between the tracks are set the poles carrying double brackets for the trolley wires. The poles are of Southern pine, 30 ft. long, 12 × 14 ins. at the butt and 10 × 10 ins. at the top, and these are spaced 60 to 70 ft. apart on curves and 90 ft. on tangents. At the terminals and cross-overs the wires are carried by light iron girders spanning the tracks, and supported by side poles, the girders being 180 ft. apart. The poles are set in wooden boxes filled with concrete, and on the curves they are inclined inwards to allow for the angle of the trolley pole, due to the superelevation of the track, the maximum elevation being 4.8 ins. On the trestles the poles are bolted to cross timbers fastened to the piles under the floor, and also bolted to blocks placed between the poles and the guard timbers. The top of each pole is fitted with a grooved cast iron cap, which carries the six feeder cables, each of which is a bare copper cable of 500,000 circular mils cross-section, and weighing 1.56 lbs. per ft., being composed of 49 wires of No. 10 gage laid in seven strands with seven wires in each. There is no insulation between the cables and the pole, but the cap is so shaped as to shed the water, and so prevent leakage of the electricity in wet weather. The brackets are formed of two horizontal angle irons, bolted together at the ends and spread apart at the middle sufficiently to embrace the pole, to which they are bolted. The ends of the bracket are trussed by a rod passing up over the top of the pole, and at each end of the bracket is a double-suspension hanger. The trolley wire, which is 22 ft. above the rails, is oval in cross-section, with a deep groove along each side, to give a good hold for the hangers, and the lower face is nearly flat, thus giving a considerable area of contact for the trolley wheel. With this arrangement there is little fear of the trolley wheel leaving the wire as it passes the hangers. The area of cross-section is 330,000 circular mils, and the weight 1 lb. per ft. A switch interlocking apparatus is used, by which the overhead switch of the trolley wire is operated simultaneously with the movement of the track switch.

The power house, which is a little more than a mile from the junction, is a brick building with stone trimmings, built on a rock foundation, and having steel roof trusses supporting a slate roof. The size inside is 79 × 106 ft., and it is divided into an engine room and boiler room, each 79 × 52 ft., by a 24-in. partition wall, the wall being reduced in thickness to admit a traveling crane of 53 ft. span. In the boiler room are eight horizontal boilers arranged in two batteries of four each. The boilers are 6 ft. diameter and 19 ft. long, with shells ½ in. thick, and have 140 tubes 3 ins. diameter. While the boilers are rated at 185 HP. each, it is said that they will develop 350 HP. at a pressure of 125 lbs. per sq. in. The boilers are suspended from transverse I-beams by slings or hangers, the lower ends of which are riveted to the boiler shell. The smoke flues lead to a circular brick smokestack, 115 ft. high and 13 ft. diameter at the base. In the engine-room are two Greene horizontal tandem compound engines, which can be worked condensing or non-condensing. The flywheels are 18 ft. diameter, weighing 32 tons each, and are carried on 18-in. shafts. Automatic safety stops and a steam apparatus for closing the throttle are provided. The engines were built by the Providence Engine Co., of Providence, R. I.

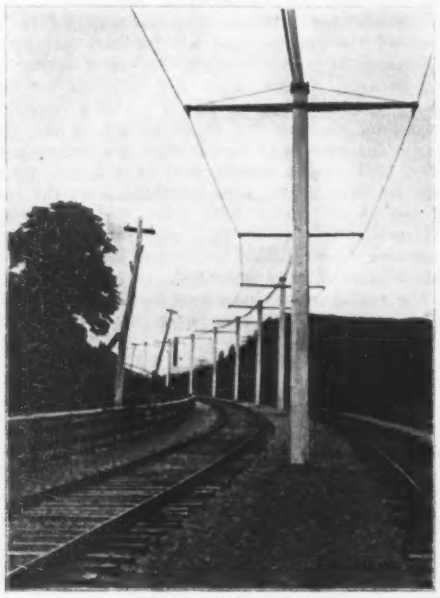
The two 1,500-ampere generators have their shafts in line with the engine shaft, and the armature spiders are keyed to it. They are 10-pole machines, and the 10 brushes are operated simultaneously by a hand wheel. The fields are of cast steel, and ironclad armatures are used, having each winding insulated, and then imbedded in an insulated recess in the laminated iron armature body. The generators are wound for a pressure of 600 volts with no load, and 700 volts with full load, and are rated for a capacity of 500 K-W. at 100 revolutions per minute. The switchboard is in front of the engines, and has for each generator an automatic circuit breaker, the usual indicating and measuring instruments and switches for the power and light circuits. There is also a recording wattmeter showing the entire output of the station. The current is carried from the switchboard by a lead-covered cable placed in a 3½-in. drain pipe set in concrete, to a junction-box at the foot of one of the trolley wire poles, the cable being led up the pole in an iron pipe, and connecting with the feeder cables which rest on the top of the pole, as already described.

The rolling stock equipment includes four large baggage cars 42 ft. long over all, weighing 30 tons, and 10 open cars with transverse seats fitted with reversible backs, these latter cars resembling ordinary street cars, but having the floor considerably higher, and reached by three step-boards extending the full length of the car. Each of the cars is carried on two four-wheel trucks with 33-in. wheels. The open cars and two of the closed cars have each two 100-HP. motors, giving a combined horizontal drawbar pull of 4,000 lbs., while the other two closed cars have four of these motors,



CLOSED MOTOR CAR ON THE NANTASKET BEACH RY.

giving a drawbar pull of 8,000 lbs. The motors are similar to those used on the Metropolitan Elevated Ry., of Chicago. The trolley pole is placed on the middle of the roof, and carries a deeply-grooved trolley wheel. The current passes along the wheel and pole to a series parallel controller, on the magnetic blow-out principle, placed on the right-hand side of each platform of the car, there being two controllers to each car. The resistances are suspended below the car. The cars are fitted with the Westinghouse air-brake. Each motor car has an air compressor with oscillating cylinder operated by an electric motor, the compressor being placed inside the door of the closed cars and on the platform of the open cars. The motor of the compressor is controlled by an automatic rheostat, which regulates the speed of the motor according to the pressure in the air reservoirs. A magnetic cut-out is provided for this motor, and the automatic circuit-breaker which forms the car cut-out is placed under the hood of the car, behind the motorman. The brake handle is on the left side of the controller handle. The closed cars are lighted by six incandescent lamps, and the open cars by 18 lamps. Each motor car is fitted with a chime whistle, sounded by air from the brake reservoirs, and two 15-in. gongs at the sides of the platform, rung by a foot lever or pedal, and has a light iron pilot under each platform. The trucks are of heavy construction, with wrought iron side frames and bolted pedestals, steel transoms and



A Curve on the Nantasket Beach Ry., Showing Standard Form of Overhead Work.

center-plates and steel swing bolsters. Helical springs are placed between the equalizing beams and the top bars of the frame, and the bolster springs are elliptical, the construction closely resembling that of ordinary passenger car trucks. Solid plate 33-in. wheels are used, and the brake-shoes are hung outside.

Single cars, stopping at each station, provide for local traffic, while express trains are made up of a closed motor car hauling open trail cars. At the terminals the motor car is switched round to the other end of the train. Tests made with a heavy motor car hauling a light load showed that very high speeds could be attained, and that the car could haul 15 heavily-loaded freight cars at good speed.

An exposition of hygiene was formally opened by the President of the French Republic on June 27. This exposition is held in the Palace of Liberal Arts, on the Champs de Mars, Paris, and is presided over by Dr. Brouardel. The proceedings and exhibits are divided under the five following heads: I., The hygiene of private houses; II., the hygiene of cities; III., prophylaxis of transmittible diseases, demography, and sanitary statistics, sanitary science; IV., the hygiene of infants, alimentary hygiene, health in clothing, physical exercise; V., industrial and professional hygiene.

The refuse of the city of New York, deposited at properly designated places, within the year ending June 30, 1895, amounted to 8,952,453 cu. yds. Lieut.-Commander D. Delehanty, U. S. N., and Supervisor of New York Harbor, in his annual report, says that an enormous amount of waste matter is now deposited at the mouth of the harbor, to the great injury of the channels. He calls for reform in the methods of handling this refuse, and says that the type of vessel now used is not suitable for passing far enough out to sea to deposit a load clear of the channels. Lieut.-Com. Delehanty is the inventor of the dump-boat known by his name, which is especially designed to go to sea in any weather and to any distance. In his report, however, he suggests that the present difficulty might be solved by using this refuse to fill in large areas of partially submerged lands, which might be thus reclaimed to the protection of the harbor and to the advantage of the community.

The number of central stations in France for the distribution of electrical energy was 328 on Jan. 1, 1895, Paris not included, says "L'Industrie Electrique." These 328 stations are divided as follows, as to motive power employed:

Motive force.	No. of stations.	HP.	Per-centage.
Hydraulic	151	9,650	24.50
" and steam	39	6,000	15.00
Steam	119	22,000	56.00
Poor gas	5	220	0.55
City gas	14	1,550	3.95
Totals	328	39,420	.....

Divided according to the nature of the current and the power utilized, the list stands as follows:

	No. of stations.	HP.	Per-centage.
Continuous currents	260	27,895	70.75
" and simple alternating	73	10,645	27.00
" and polyphase "	3	880	2.25
Totals	336	39,420	.....

In the above enumeration the number of stations is slightly modified, eight of them having at the same time distribution by continuous and by simple alternating currents. The figures given show that the alternating current stations develop considerably more average power than those operated with continuous currents; the figures comparing as 145 to 110 HP. Of the 328 stations 29 are operated by municipalities, with light hydraulic power. Gas companies operate 26 stations; some of them very important. On Jan. 1, 1895, 34 stations were under construction, and 74 more were projected; or a possible total of 108 for the year, as compared with 115 central stations constructed in the year 1894.

The recently completed aqueduct bridge of Argenteuil, which is to carry the sewage of Paris across the Seine to the newly acquired sewage farms, has the following dimensions: It is a steel arched bridge of three spans, two of 219.76 ft. and one of 229.60 ft., with a girder span of 26.24 ft. across the road on the right bank. Each arch is made up of five plate-girder ribs spaced 6.56 ft. apart and carrying between them the four lines of steel conduits, each 3.5 ft. in diameter. The floor of the bridge has a total width of 31.16 ft. between hand rails, and includes a roadway for vehicles and two footways, each 5 ft. wide.

The extent to which bids for contract work are affected in amount by the adjustment of methods to the work in hand is well illustrated by a recent letting at Ithaca, N. Y. In bidding on some outfall sewer work involving dredging a trench 2,500 ft. in length to an average depth of 2¼ ft. in from 0 to 11 ft. of water four bidders proposed to use a regular dredge and offered to do the work at prices ranging from $3,700 to $2,900; one bidder proposed to use a pump and charge $864; the successful bidder, Burns & Banks, of Niagara Falls, N. Y., proposes to use a hand scraper at a cost of $556. The lake end of the outfall sewer will be of 14-in. wooden pipe, weighted with stone. It will extend 6,175 ft. from the above into 30 ft. of water. The outfall will also include 3,875 of 14-in. cast iron pipe laid in a 5-ft. trench. All this work will be done by the above contractors. The several bids on various parts of this work were given in our "Construction News" columns July 18. Mr. Henry N. Ogden is chief, and Mr. Rudolph Hering consulting engineer to the Sewer Commission of Ithaca. Mr. Roger B. Williams is chairman of the commission.

The present bicycle craze is likely to have a marked influence in furthering the adoption of smooth street pavements. In Brooklyn, Hartford, St. Paul and other cities the petitions for asphalt pavement multiply in a rapidly increasing ratio, and the authorities recognize that much of the pressure for such pavements comes from the class preferring a smooth pavement to rough stone for wheeling purposes alone. This new demand, coupled with the acknowledged merits of asphalt, from a sanitary and economical point of view, is likely to materially increase the use of this pavement on city streets.

The wheelmen of Brooklyn at a late meeting urged the building of an asphalt paved road from Greenpoint to the western district of the city. They ask for the repaving with asphalt of Leonard St., from Greenpoint Ave. to Broadway, and of Throop and Kingston Aves., to the system of parks and boulevards in the western part of the city. The plan is objected to by some of the abutting property owners, owing to the expense entailed upon them, and the wheelmen will now make an effort to win over these owners on the score of the increase in value of their property by reason of better pavements.

A new building ordinance has just been passed by the city of Pittsburg, Pa., which provides that all buildings, except churches, 60 ft. or more in height, shall be either of slow-burning or fire-proof construction. Buildings over 60 and less than 90 ft. in height in which all the members "carrying loads and resisting strains" are of wood must have 8 × 10-in. beams and girders, 10 × 10-in. posts, and floors 3¼ ins. thick in two layers, and partitions of incombustible material or 4-in. solid wood. Buildings over 90 ft. high with metal frames must have the frame protected from fire. Other restrictions are placed on each class of buildings. Schools and hospitals over one story high and hotels or lodging houses with more than 20 rooms must be of fireproof construction.

The field in which cable traction of street railway cars is more economical than electric traction has been defined by the superintendent of a railway company in Chicago. According to his view electricity cannot compete with the cable under certain conditions of heavy traffic. He says that when there is sufficient traffic to justify 12 cars to the mile of double track the cable becomes the cheapest form of traction, and electricity cannot compete with it. On the other hand, when the traffic is not sufficient to justify more than four cars to the mile of double track, horses become the cheapest form of motive power. With traffic anywhere between these two extremes electricity is the most desirable.

A model mail car for cable railway service has been built by the Third Avenue Cable Ry. Co., in New York city. The car is 22 ft. long and 7½ ft. wide, with the interior fitted up much in the same way as a mail car for steam railway service. It would carry a working crew of four mail clerks. Ten of these cars will be in operation by Oct. 1, and will be run as trailers, at half-hour intervals, between the Post Office and 129th St., and at longer intervals to Fort George. These cars will reach eight sub-stations, and supersede a large number of wagons now used. The contract with the company has not yet been closed by the Post Office authorities, but it probably will be in a very short time, as the arrangement proposed is deemed very satisfactory.

The progress of electric traction in Europe is thus set forth by "L'Industrie Electrique": In one year the number of electric railways has increased from 43 to 70, and the aggregate length of lines from 189 miles to 434 miles. The total capacity of central stations has grown in the same time from 10,650 to 18,150 kilowatts, and the number of motor cars from 538 to 1,236. Germany heads the list with 227 miles of line; then come France, with 59.7 miles; England, with 42.6 miles; Austria-Hungary, with 27.8 miles; Switzerland, with 23 miles; Belgium, with 13.4 miles; Italy, with 11.7 miles; Spain, with 8.7 miles; Russia and Servia, with 6.2 miles each; Sweden and Norway, with 4 miles, and Roumania, with 3.3 miles. Germany has 22 separate lines in service; England has 13; France, 11, and Switzerland, 8. Out of 70 lines, 55 lines use the trolley system with overhead conductors. We may repeat in this connection the latest figures for the United States given in our issue of July, which showed 10,363 miles of electric railway in operation.

The Pennsylvania R. R. Co., through its Philadelphia & Delaware County branch, is having war with the Delaware County Passenger Ry., a trolley enterprise which has secured the right to lay its track on the Westchester & Philadelphia turnpike, from Philadelphia to Westchester, a distance of 21 miles. The trolley company first had trouble in securing the consent of property owners to overhead construction, and five withheld their consent to the last. But as the charter of 1858, under which the company is working, permitted the use of horses or steam, they have purchased 10 steam dummies and proposed to start with these. But the trolley line intersects the Pennsylvania branch steam road at Llanerch, and that corporation has applied to the courts for an injunction to restrain another steam road crossing its track at grade. The people also strongly object to the dummies on the turnpike, and the final outcome is uncertain.

A railway from Pekin to the southern provinces of China is said to be under consideration, and the Chinese legation at Washington is reported as seeking foreign aid and capital for this purpose. The line proposed would be about 600 miles long, extending from Pekin to Han-kau; but as yet little else seems to be

known concerning it than that recent events have shown the Chinese the desirability of better internal communication.

The utilization of the power of the Nile cataracts is proposed by M. Prompt, Inspector-General of Roads and Bridges in Egypt. He would begin by securing a fall of 45 to 50 ft. at Assuan, and from the station there created he would expect to obtain about 40,000 HP. He would dam the river again near Cairo, securing a 15-ft. fall, and with the electric power generated at these points, he would furnish light to Cairo and power to operate large cotton mills. He also proposes to utilize the water thus stored for irrigation purposes, and estimates the total expenditure required as less than $10,000,000.

Steel rails of Canadian or English manufacture are, it is reported, to be used exclusively on the government railways of Canada. The recent purchase of a large amount of steel rails by the Canadian Pacific Ry. from a firm in the United States at a much lower price than was quoted by English manufacturers, led to a bill being introduced in the Canadian Parliament prohibiting railway contracts with aliens. The bill was withdrawn on the promise of the Minister of Railways that he would ignore bids from the United States, whether or not they were lower than the Canadian or English bids.

Railway exemption from taxation promises soon to be a thing of the past in North Carolina. The legislature in 1891 passed a law requiring all the railways to pay taxes, including several which were by their charters exempt from taxation. All the companies have now given up their charter exemption except the North Carolina R. R. Co., which owns the line from Goldsboro via Raleigh and Greensboro to Charlotte. This is the most important railway of the state. It forms part of the Southern Ry. system and is one of the few lines which is able to pay a good profit from its operations. Three-fourths of the capital stock is owned by the state, and the state authorities of course desire to secure a stockholders' vote to give up the charter right to tax exemption. The private holders of the other fourth of the stock of course oppose this, and by staying away from stockholders' meetings when called they have thus far been able to prevent a quorum of the stock from assembling, so that no legal meetings can be held. It is not likely, however, that they can continue such an unequal struggle very long.

The Corps of Royal Engineers in the British Army numbers 938 officers to 5,525 enlisted men, or one officer to less than 6 men. The Corps of Engineers in the U. S. Army, 1894, contained 121 officers of all grades. According to the standard of the German Army, the Royal Engineers should have only 288 officers. These English officers are mainly place-holders, doing little work, and a prominent officer of the English Army, himself an R. E., figures that 270 officers would fill all the engineering posts properly belonging to this Corps. As one means of disposing of them 350 are forced upon the Indian Government, displacing Engineers in the Civil Service, and creating endless rivalry and controversy, with resultant damage to the Public Works Department of India.

The Institution of Civil Engineers, according to the report handed in at the last annual meeting, held in London on June 28, has 5,921 members of all classes, of these 17 were Honorary Members, 1,862 were Members, 3,687 were Associate Members and 355 were Associates. The Student class, not included in the above, numbered 816. The net increase in membership in the year was at the rate of 3%. The total income was $151,740, and the general expenditure was $91,925; the expenses on the new building amounted to $35,650. Owing to changes going on in the institution's house, only 20 meetings were held in the year for the reading and discussion of papers at these meetings. Exclusive of the President's address, 14 original papers were presented. For students 11 supplemental meetings were held. The officers elected for the new year were: President, Sir Benjamin Baker; Vice-Presidents, J. Wolfe Barry, W. H. Preece, Sir Douglas Fox and James Monsergh.

The 41½-in. lens for the Yerkes telescope, to be presented to the Chicago University has been completed by Alvan G. Clark & Sons, at Cambridge, Mass. The surface diameter is 41½ ins., and the weight is 500 lbs. The exposed surface or aperture will be 40 ins., and it is thus 4 ins. larger than the lens in the Lick Observatory, which has been heretofore the largest in the world. The outer lens is a double-convex lens of crown glass, weighing 200 lbs., and the inner one is a plano-convex lens of flint glass, weighing 300 lbs.

A rapid-fire gun, using ammunition in the original cases, has been invented by Mr. E. G. Parkhurst, of Stamford, Conn. Heretofore all ammunition used in guns of this class had to be removed from the packages furnished by the government and especially arranged in belts or otherwise for use. No description of the gun is given other than the fact that 1,000 rounds have been fired with complete success.

The latest "perpetual motion" inventor is a Newark Italian, Michael Patrono, who has demonstrated his ability as a financier by securing the investment of some $6,000 of his countrymen's savings, according to newspaper reports. His ability as an inventor, however, appears to be not so well proved, and as the expected results have not materialised the Italians who have bought stock in the company are "looking daggers" at Michael, or would if they could see him. The matter has been taken into the courts, and the investors are trying to get possession of 500 lbs. of mercury in the inventor's shop, which very likely is "what made the wheels go round."

BOOK REVIEWS.

PORTLAND CEMENT.—By Charles D. Jameson, M. Am. Soc. C. E., Professor of Engineering, University of Iowa. Published by the University; 8vo; paper; pp. 192; illustrated; $1.

This monograph on the manufacture, testing and use of hydraulic cements is the outcome of a series of lectures on the subject delivered before the students of the institution in which the author has been a professor for many years. In many ways the text bears evidence of its origin, by including matter which, while necessary to the student, could have been replaced with more useful information to the engineer in practice. The book, however, will be found very useful by engineers on account of its summaries of the most recent experiments and information published by the large European testing laboratories, where the testing of cement has been carried on to an extent unknown in this country.

ATLAS OF THE STATE OF NEW YORK. Prepared under the direction of Joseph R. Bien, E. M., Civil and Topographical Engineer, from original surveys and various local surveys revised and corrected, based on the triangulations of the U. S. Coast & Geodetic Survey, U. S. Geological Survey, U. S. Lake Survey, and the New York State Survey. New York: Julius Bien & Co. Atlas folio; 36 maps and lists of counties, cities, and villages, etc.; $32.50.

This excellent atlas, doubtless the best ever published of the state of New York, commences with a fine map of the United States reduced from the 9-sheet map of the U. S. Geological Survey. Among the maps of the whole state of New York is one showing the location of 226 original land-grants, patents and purchases. Other maps of the state show the density of population, mean annual rainfall, mean annual temperature, and general elevations. The statistics of the state are indicated graphically and by colors. The maps of cities and counties which follow are executed with the fullness of detail and excellence of workmanship characteristic of this well-known publishing house. The map which shows Kings, Queens, Richmond, Rockland, Westchester and Putnam counties, all on one sheet, is especially desirable as showing the relative position of New York city and its entire suburban territory.

THE LAW OF IRRIGATION, Including the Law of Water Rights and the Doctrine of Appropriation of Waters, as the Same are Construed and Applied in the States and Territories of the Arid and Semi-Humid Regions of the United States; and also Including the Statutes of the Respective States and Territories, and Decisions of the Courts Relating to Those Subjects. By Clesson S. Kinney, of the Salt Lake City Bar. Washington: W. H. Lowdermilk & Co. 8vo; pp. 792; $7.

Many irrigation engineers in their practice find it absolutely essential to be posted in a more or less general way regarding the legal aspects of water supplies in one or more states. This volume seems admirably adapted to their needs or to like needs on the part of financiers and others. Those who wish to go deeper into the subject will find that provision has been made for their wants, but we shall not attempt to pass upon the merits of the volume from a legal point of view.

The author points out in his preface that the water rights of irrigators, as regarded in this country, are altogether different than the rights in water under the common law, which does not recognize priority of appropriation.

Part I. of the volume, comprising some 530 pages, treats chiefly of "the nature and history of irrigation and the general laws that govern the subject in the arid region." Part II. gives for each state and territory a sketch of the general conditions affecting irrigation and "an abstract of the statutory laws and the construction of those laws by the courts."

THE BELLEFONTAINE BRIDGE. A Report to Charles E. Perkins, President of the Chicago, Burlington & Quincy R. R. By George S. Morison, Chief Engineer of the Bellefontaine Bridge. Oblong folio; 18 half-tone engravings and plates.

This bridge crosses the Missouri River on the main line of the St. Louis Extension of the St. Louis, Keokuk & Northwestern R. R., now owned by the Chicago, Burlington & Quincy R. R. Co. The bridge is a double-track railway bridge, with four through spans, each 440 ft. long between centers of end pins. At the north end is a steel viaduct, 849.83 ft. long, consisting of 28 spans resting on brick piers, with pile foundations. The total length of the permanent structure is 2,630.77 ft., and the north approach consists of 2,900 ft. of temporary wooden trestle. The bridge piers are founded upon pneumatic caissons, surmounted by cribwork filled with concrete, and the piers proper are built of limestone masonry. The combined height of the caisson and cribwork ranged from 40 to 80 ft. The first work was done on July 4, 1892, and the first train crossed on Dec. 27, 1893. The New Jersey Steel & Iron Co. constructed the superstructure, and A. & P. Roberts built the steel viaduct; the firm of Christie & Lowe had the contract for the masonry. The four pneumatic foundations, including freight charges, cost $230,781; the five piers cost $428,734, including the pneumatic foundations; the bridge superstructure cost $545,045, and the viaduct cost $68,731. The total cost of the whole structure was $1,322,719. The report of Mr. Morison gives in detail the progress of the work and the itemized costs, and illustrates fully the location and dimensions and character of the foundations and superstructure, by diagrams and half-tone engravings.

A TREATISE ON CIVIL ENGINEERING. By W. M. Patton, author of A Practical Treatise on Foundations; formerly Professor of Engineering at the Virginia Military Institute, engineer in charge of the Mobile, Ohio, Susquehanna and Schuylkill River bridges; late Chief Engineer of the Mobile & Birmingham, and the Louisville, St. Louis & Texas Railways; Consulting Engineer, Chicago, Ill. John Wiley & Sons, New York. 8vo; 1,633 pp., with maps and diagrams; $7.50.

The author of this work has attempted to condense into about 1,600 pages the theory and practice of the more important branches of engineering; but he wisely explains that his only aim is to present the essential and fundamental principles and a selection of practice without any attempt at exhaustive treatment. He refers his readers to the innumerable special treatises and text-books for further and closer study in any particular branch of the broad profession of engineering. From this point of view, he has succeeded well, and his book will doubtless meet an existing demand for "a general work on civil engineering." The subjects more or less fully discussed include the following: Surveying, railway location and economics, location and construction of country roads and resistance to traction, city and hydrographic surveying, building materials, metals, structural engineering and the elasticity and resistance of materials, strength and tests of cements and artificial stone, foundations of all classes, ordinary earthwork, quarrying, stone cutting and masonry, retaining and reservoir walls, dams, the construction of tunnels, sewers and canals, the theory of framed structures, bridges, etc.; river and harbor improvement, hydraulics, etc. The above outline gives an inadequate idea of the mass of material here gathered together, but want of space forbids any extended critical review. The author has attempted an unusually difficult task, for in condensation of this character the writer is troubled where to draw the line in treating of matter upon each branch of which volumes have been written. Under these circumstances it is but natural that he has omitted practical examples which some engineers would class as essential; and in other cases has said too much upon certain subjects, without saying enough to make the subject complete. But, as a rule, the author has treated his matter from the standpoint of the latest and most approved practice, and has produced a useful book for the purpose intended.

REPORT ON THE USE OF METAL RAILWAY TIES, AND ON PRESERVATIVE PROCESSES AND METAL TIE-PLATES FOR WOODEN TIES.—By E. E. Russell Tratman, C. E. Pub. Doc. Forestry Division, U. S. Department of Agriculture, Washington, D. C. 8vo; pp. 363; plates, 5.

The part of this report referring to metal ties is supplementary to a former report, published in 1890, and reviewed in our issues of Aug. 30, 1890, and Aug. 15, 1891. The purpose has been to record the development and experience during the period since 1890 rather than to bring the statistics of mileage completely up to date, but the aggregates of the mileage statistics show an increase in the proportion of track laid with metal ties to the total length of railways of the world, from 13.2% in 1890 to 17.2% in 1894, and, allowing for the incompleteness of the returns, it is estimated that this means probably 20% in 1894 as compared with 15% in 1890. This is exclusive of the United States and Canada, which have a great railway mileage, but an infinitesimally small percentage of metal track. In general, it is shown that metal ties have been successfully applied and are in successful use under all conditions of climate, traffic and track, and in many cases under conditions approximating to those which obtain on railways in the United States. In view of the possibilities of steel-tie manufacture as an industry in this country, the report takes up the questions of material and manufacture at some length, and reference is made to the great re-

ductions in the price of steel. The tabular summary of the existing mileage of metal track is as follows:

	Total metal t'ck. 1894.	Total metal t'ck. 1890.	Total track. 1894.	Total track. 1890.	P'c't'ge of metal track. 1894.	P'c't'ge of metal track. 1890.
	Miles.	Miles.	Miles.	Miles.		
1. Europe	13,404	10,222	137,000	132,071	10.00	7.74
2. Africa	2,326	1,200	5,600	5,202	40.00	24.80
3. Australia.	234	186	12,000	10,640	2.00	1.75
4. Asia	14,586	9,314	22,000	19,106	66.30	48.75
5. So. & Cen. Am., West Ind. and Mexico	4,416	3,788	21,500	20,702	21.00	18.30
6. U. S. and Canada	12	2	190,000	174,000	.....	.....
Totals	34,863	24,802	389,100	361,886	9.00	6.85

	1894.	1890.
Total mileage of metal track	34,863	24,800
Total railway mileage of the world (exclusive of the U. S. and Canada)	198,000	187,721
Percentage of railway mileage with metal track (exclusive of the U. S. and Canada)	17.00	13.21

Very little progress has been made in this country, and the laying of the 18,000 steel ties manufactured for the New York Central R. R. has been delayed by difficulties connected with the necessity of insulating the rails from the ties owing to the use of a rail circuit for signal operations. An appendix gives a list of some 250 patents on metal track, making about 750 patents since 1839, but it is said that the proportion of new patents with useful or practical ideas is small, the majority being for modifications of former designs, while many of the patented designs are hopelessly complicated and impracticable.

The part of the report referring to the use of preservative processes and protective metal tie-plates on wooden ties is a new feature, and it is stated that the economy and improvement effected on American railways by these means within the past few years are among the important reasons for the slow introduction of metal ties. The selection and cutting of ties, and their renewals, are discussed, and the various preservative systems are described, with details of American practice, including the systems adopted on the Southern Pacific Ry. and Atchison, Topeka & Santa Fe Ry., as described in our issues of April 26 and Sept. 13, 1894. The great advantages of metal tie-plates in increasing the life and efficiency of the ties are pointed out, as well as the economy effected in the daily work of maintenance, owing to the reduction of the work of respiking, correcting gage, tamping loose ties, etc., but the full benefit of the expense involved in the treated ties and the metal tie-plates can only be assured when both are used together. The appendices include reports on the preservation of timber by Henry Flad and Capt. W. H. Bixby, and a description of the preservative processes used on the Prussian State Railways.

WATER SUPPLY OF NEW JERSEY.—Report on Water Supply, Water Power, the Flow of Streams and Attendant Phenomena. By Cornelius Clarkson Vermeule, Consulting Engineer. Volume III. of the Final Report of the State Geologist. 8vo; pp. xiv., 448; numerous tables and illustrations. Address John C. Smock, State Geologist, Trenton, N. J.

The work of the Geological Survey of New Jersey has long been acknowledged as ranking at the head of undertakings of this class. The waters of the state have been recognized from the first as among the most valuable of its mineral resources. The first publication of the survey, in 1868, contained a chapter on water, which included a number of analyses of well and river waters. In later publications the subject was taken up from time to time, the report for 1876 being largely devoted to the water supply sources of the northeastern portion of the state, with a special view to the needs of the cities in that section. In 1890 the preparation of the present volume was begun by Mr. Vermeule, who is intimately acquainted with the physiography of the state, through long service as head of the topographic division of the survey. Some of the results of the investigations for this volume have appeared in the yearly reports of the survey, and have added to the keenness of the anticipation of the appearance of the final volume.

It might be thought that a work of this sort would be of small interest outside the state to which it refers, but so little reliable information is available concerning the yield of watersheds that every carefully prepared study of new territory adds greatly to the material in hand for general deductions. Unfortunately it is often true that such general deductions are wellnigh the only guides which the engineer can find to lead him to some of his most important conclusions when gathering data from which to design works for the storage and supply of water. This will remain the case, but to a diminishing extent, until reliable records of rainfall and stream flow can be secured for all sections of the country.

The first hundred pages of this report are devoted to the laws governing the flow of streams. In this section there are presented some rainfall statistics covering long periods, and others of shorter range, for a number of localities, together with a general discussion of the subject, including dry years. Evaporation is considered, and the results are given of observations at Boston and at Emdrup, Denmark, on evaporation from water surfaces, and of some observations elsewhere on the evaporation from the earth. After taking up ground and surface storage and flood flows, the author presents a valuable collection of long-series stream gagings for the Sudbury, Connecticut, Croton, Passaic and Potomac rivers, and for some streams which have been gaged in connection with possible future water supplies for Philadelphia. These gagings are studied from various points of view, and the deductions from them are finally applied to New Jersey streams in connection with such rainfall statistics and other data as are available for each stream.

The sections on individual streams occupy some 150 to 200 pages and present much information relating to the streams and their watersheds. A few pages are devoted to chemical analyses, in which the results of analyses for this report and for other purposes are presented. The subject of stream pollution is briefly touched, and some statistical and other information is given regarding the public water supplies and water powers of the state, the daily consumption of water for public purposes being given by watersheds.

Appendix I. consists of a list of the developed water powers of New Jersey, prefaced by an estimate of their value and the number of mills and net horse power by watersheds and industries. Appendix II. is a tabulated list of the drainage areas of the state with the percentages of each in forest and the 1880 population of each drainage area.

A number of valuable diagrams are included in the report, and an unusually fine collection of half-tone reproductions of photographs of New Jersey water scenery. The photographs from which these illustrations were made must have been admirably suited to their purpose, having good contrasts of light and shade and being sharp and clear in outline.

FILTRATION OF PUBLIC WATER SUPPLIES. By Allen Hazen, Late Chemist of the Lawrence Experiment Station of the Massachusetts State Board of Health, and Chemist of the World's Columbian Exposition, Member of the Boston Society of Civil Engineers, etc., etc. New York: John Wiley & Sons. 8vo; cloth; pp. x., 197; 16 figures in the text and one folding plate; numerous tables; $2.

The need for a book treating this subject from the standpoint of recent developments has been becoming more and more evident for many years. When Mr. Jas. Kirkwood made his report on the "Filtration of River Waters," which was published in 1869, a number of European cities were already filtering their water supplies. Many more have taken up the practice since then, but although 56 years have elapsed since the first filter beds were built at London, Mr. Kirkwood's report has remained until the present year practically the only book on this subject. Within the past ten years the science of water filtration has been revolutionized by the discovery that the process will remove disease germs from drinking water. It is also within the same period that the relation between drinking water and disease has begun to be understood by scientists and realized to some degree as a terrible fact by the people at large. Sufficient progress has now been made in our knowledge of the harmfulness of polluted water and positive measures to minimize its dangers to make a book describing the latter not only timely, but almost imperative.

Mr. Hazen is eminently fitted to set forth the modern theory and practice of simple sand filtration as a means of removing disease germs from water, and to this single phase of the great water purification problem and to this single method of solving it his book is devoted. That the removal of harmful bacteria is the most important work that can be accomplished by purifying water no one will question, and that it can be best accomplished by slow sand filtration Mr. Hazen has not the slightest doubt. For other phases of water purification one must look elsewhere, except that a short chapter is devoted jointly to mechanical filtration, household filters and the Anderson system of contact with metallic iron and subsequent sand filtration. Having mentioned this particular chapter, it may as well be stated here that the author's treatment of mechanical filtration is on the whole unsatisfactory. Such indications of the development of this system as are presented are misleading, and, after giving only seven pages to the subject, the questions of cost and efficiency are dismissed until after it has been decided whether on a polluted water supply mechanical filtration

is capable of removing the bacteria under normal conditions of operation; and, second, that the mechanical arrangements are so perfect that the results will not be dependent upon the attendant to such an extent that mere negligence, perhaps during the night when detection is improbable, may subject the city to all the bad results of polluted water.

In view of the fact that mechanical filters are now in use on the water supplies of from 75 to 100 American cities and towns (often for clarifying, principally or wholly), and are being urged by their makers for use in many more, some fuller discussion of their proper field of usefulness, and their limitations, would have been welcomed by most engineers.

It was stated above that Mr. Hazen is eminently fitted to discuss sand filtration. This is well known by those who have followed the Massachusetts experiments in water and sewage purification and the other work done by him. Since leaving the Lawrence Experiment Station and the sewage purification plant of the World's Columbian Exposition, Mr. Hazen has visited the principal water-works of Europe, especially those where water filtration is practiced, and made careful study of his subject in those foreign cities whose practice in this respect is most notable.

Sand filtration has been practiced for half a century abroad, as already stated, but scarcely at all in this country until quite recently. Mr. Hazen does not concern himself with the history of the art, nor does he attempt to describe individual filtration plants, except for the purpose of illustrating special points. His plan is to present the essentials for success in removing harmful matters from drinking water. The methods discussed by him are chiefly continuous and intermittent filtration through artificial beds of sand.

The first chapter is entitled "Continuous Filters and Their Construction." By continuous filters are meant such as are operated continuously, with the exception of the intervals needed for cleaning and repairs. The term is used in opposition to intermittent filters, which are designed to come to rest at certain intervals for the admission of supplies of air directly to the interstices of the sand. Nearly all the filter beds thus far built throughout the world are operated on the continuous plan.

It is impracticable to enumerate the various details of construction and operation discussed by the author in this and the succeeding chapters. The treatment is as exhaustive as could be expected within the limit of 200 pages, and there are but few points where a fuller description seems needed.

The chapter on "Filtering Materials" would not have been possible, or at least practicable, had not the author visited foreign works. While on his trip abroad he collected samples of sand, which have since been subjected to mechanical analysis, in order to compare them with similar analyses of sands used in the Lawrence experiments, and to judge of the relation between the character of filtering materials and work done by the same. This chapter is supplemented by an appendix on "Method of Sand-Analysis," reprinted from the Annual Report of the Massachusetts State Board of Health for 1892. The design of underdrains is considered here. Altogether this chapter will doubtless be a revelation to many, for never before has there been brought together so much matter bearing on the proper material for sand filter beds.

The "Rate of Filtration and Loss of Head" are next considered, after which comes a chapter on "Cleaning Filters. The principal cost of operating sand filter beds is for cleaning, and upon the proper performance of this, both as to frequency and effectiveness, the work of filters very largely depends. Loss of head is caused by clogging of the beds, and the rate of filtration is of course reduced as this occurs, although it can be overcome to a certain point by increasing the head on the filters. Upon the rate of filtration both the size and efficiency of the plant will depend. Altogether these two chapters are perhaps the most important in the book.

The "Theory and Efficiency of Continuous Filtration," instead of being discussed under the chapter on continuous filtration, is taken up separately as Chap. VI., perhaps to bring it in close connection with "Intermittent Filtration," which follows directly after. The latter subject is not discussed very fully, that evidently being deemed unnecessary after all that had preceded, and in view of the fact that the essential difference between the systems is that indicated by their respective names.

The chapter entitled "Other Methods of Filtration" has already been commented on.

The last two chapters are on the "Cost and Advantages of Filtration" and "Water Supply and Disease." The costs per acre of filters for nine cities, American and foreign, are given and an estimate of the cost of operation is presented. A table is also given showing the deaths from typhoid fever in 1890, both total and per 100,000 living, and the sources of water supply for cities in the United States having 50,000 population and upwards in 1890. To this table are appended similar figures and facts for eleven large European cities.

Much valuable information is given in the appendices, including the rules of the German Government regulating filtration; tabular information regarding the character and extent of filtration works in some 30 European cities, and relating to the operation for one year of filters in 15 European cities; and brief descriptions of the water supplies of London, Berlin, Hamburg and Altona, with notes on some other European supplies. The last appendix is a bibliography of filtration.

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PERSONALS.

Mr. M. K. Muller has been appointed Superintendent of Streets at Oakland, Cal.

Mr. L. H. Short, civil engineer, of San Francisco, Cal., died recently in that city.

Mr. Frank Kizer has been elected Superintendent of Water-Works at Spokane, Wash.

Mr. S. S. Morris has resigned his position as Assistant Superintendent of the Oregon Short Line Division of the Union Pacific Ry.

Miss Marian S. Parker, of Detroit, Mich., is said to have graduated from the University of Michigan with the degree of bachelor of science in civil engineering.

Mr. John E. Barrett has been appointed Superintendent of Track, Bridges & Buildings of the Lehigh & Hudson River R. R., with offices at Warwick, N. Y.

Mr. Nathan Marvin Belden, civil engineer, died at Wilton, Conn., July 28. He had been a Railroad Commissioner for eight years, and had represented Wilton in the state legislature.

Mr. John Heard, Jr., M. Am. Inst. Min. E., who died some weeks ago in Italy, was one of the pioneers in prospecting for and developing the nickel deposits of the Sudbury region in Canada.

Mr. Russell R. Stuart, of Syracuse, N. Y., is a candidate for the Democratic nomination for the office of State Engineer and Surveyor. He has been a Division Engineer in the state service since 1880.

Mr. Robert Bruce Langdon, a well-known railway contractor, died at Minneapolis, Minn., July 24, at the age of 68. At the time of his death he had a contract for a large irrigation canal in Arizona.

Mr. Daniel B. Luten has been appointed Instructor in Architectural and Sanitary Engineering at Purdue University, Lafayette, Ind. He was formerly Instructor in Civil Engineering at the University of Michigan.

Mr. E. K. Hooper, M. E., who has acted as Engineer and agent for the Abendroth & Root Mfg. Co. for the past three years, has resigned that position to become a member of the engineering staff of the Deering Harvester Co., of Chicago.

Mr. Severance Burrage, who has been appointed Instructor in Sanitary Science at Purdue University, Lafayette, Ind., was formerly an instructor in the Massachusetts Institute of Technology and Biologist to the State Board of Health.

Mr. Dankmar Adler, of Chicago, member of the firm of Adler & Sullivan, architects, has retired from that firm to accept the position of Consulting Architect for the Crane Elevator Co., of Chicago. The business will be carried on by Mr. Sullivan.

Mr. Austin T. Byrne, author of "Highway Construction," and Mr. Gardner S. Chapin have entered into partnership under the firm name of Byrne & Chapin, with offices at 171 Broadway, New York city, and will carry on a general engineering business.

Mr. George W. Bartlett has been appointed General Manager of the Centralia & Chester R. R., with office at Sparta, Ill. He was formerly Division Superintendent of the New York, Lake Erie & Western R. R., and General Superintendent of the Buffalo, Rochester & Pittsburg R. R.

Dr. Alexander Macfarlane, formerly Professor of Physics at the University of Texas, has been appointed Lecturer in Electrical Engineering at Lehigh University, Bethlehem, Pa. He is the author of several papers presented before the American Institute of Electrical Engineers.

Mr. George W. Bishop, of Athol, Mass., Roadmaster of the Fitchburg R. R. since 1874, and a past president of the New England Roadmasters' Association, has been appointed a member of the Board of Railroad Commissioners of Massachusetts, to fill the vacancy made by the death of the late Mr. E. A. Stevens.

Col. David M. Yeomans died at Kinsman, O., July 24 at the age of 56. He was originally an oil producer, but was for many years in Europe introducing American inventions, among them the Westinghouse brake and Pullman cars. In his later years he was prominent as a promoter of various railway and other projects.

Mr. E. B. Stahlman, of Atlanta, Ga., Commissioner of the Southern Railway & Steamship Association, has resigned his position, which he has held for 3½ years. He has been in railway service for nearly 37 years. He was Third Vice-President of the Louisville & Nashville system previous to his election as Commissioner.

Col. E. K. Sibley, of East Orange, N. J., who died on July 30, at the age of 53, was General Manager and Receiver of the Memphis & Little Rock R. R. from 1882 to 1885, when he became Superintendent of the Missouri Pacific Ry. Later he was a member of the Board of Arbitration of the Southern Railway & Steamship Association.

Messrs. Rudolph Hering, Geo. H. Benzenberg and Desmond FitzGerald, all members of the American Society of Civil Engineers, have been appointed by the mayor of Cleveland, O., as a commission to examine and report upon plans for the extension of the water system, disposal of sewage and purification of the river. They will meet at Cleveland on Aug. 6.

Mr. Kilpatrick, Chief Engineer of the mines of the Juragua Iron Co., near Santiago, Cuba, has returned from Cuba, the Spanish authorities having ordered him to leave on account of an alleged entertainment by him of the insurgent Gen. Maceo on July 4. It is said that the Americans were holding an Independence Day celebration, at which Gen. Maceo was an uninvited guest.

Mr. Peter C. Asserson, C. E., U. S. N., the ranking officer of his corps, has been detached from the Brooklyn Navy Yard and ordered to the Norfolk yard, for certain alleged mismanagement of his bureau in the Brooklyn Navy Yard; a transfer which is probably better accounted for by some exercise of politics by the naval authorities at Washington. Whatever the alleged cause, the transfer to a post of equal responsibility does not indicate to the outside public anything more than that the department desires to create a "vacancy" at the Brooklyn yard. Mr. Asserson served in the Navy through the Civil War, and at its close was assigned the task of restoring the Norfolk yard, which was left literally in ruins in 1865. He devoted years of hard service to this work, and so well acquitted himself that he was, in 1885, assigned to the Brooklyn yard and entrusted with the task of bringing that station up to modern requirements. When he entered upon his duties the Brooklyn yard was practically without a dry-dock or a wharf at which a ship could be tied up, for the old stone dry-dock was leaking, and its gates were propped up by temporary struts; the old wooden wharves were rotten, and there was only 15 ft. of water in the Wallabout Channel, which connects the yard with the East River. The buildings and machinery were in an equally bad state of repair. Since that date, and under the direction of Civil Engineer Asserson, the following work has been accomplished: The 700-ft. Cob Dock wall was reinforced by cribwork and the ground in front dredged until 30 ft. of water was secured; the stone dry-dock was repaired by new granite floors, inverted arches, reset walls and new caissons and pumping plant; and this was done in six months and for $45,000 less than the estimate of the board of engineers. The Wallabout Channel was dredged to 24 ft. depth; wharves were extended, with the result of obtaining nearly 5,000 ft. of water front for the yard, protected by a granite-coped concrete wall; artesian wells were sunk; an electric lighting plant was installed; the streets were graded and repaved, and, under Mr. Asserson as constructing engineer, the large timber dry-dock No. 2 was built by J. E. Simpson & Co. Among the work commenced but yet unfinished at this yard are the new timber dry-dock No. 3; the new boiler shop, 265 × 108 ft., nearly completed; the refuse crematory; the steel plate bending shop; 1,800 ft. of sea wall in various stages of construction, and over 2,000 ft. of boundary wall, besides new office buildings, etc.

Mr. F. P. Stearns, M. Am. Soc. C. E., has been appointed Chief Engineer of the Metropolitan Water Board, lately created to provide a water supply for Boston and nearly 30 other cities and towns in its immediate vicinity. From 1872 to 1880, Mr. Stearns was engaged on the Sudbury River water supply of Boston, first in making investigations for the scheme, and later having charge of the construction of a portion of the aqueduct, and finally being connected with the operation of the works. From 1880 to 1886 he was engineer on the Boston main drainage works, having been constructing engineer in charge of the Dorchester Bay tunnel, the reservoir and outlet works at Moon Island, and afterwards executive engineer of the works. From 1886 to date, Mr. Stearns has been Chief Engineer of the Massachusetts State Board of Health, in which capacity he has done a great amount of important work, including the investigations for the Metropolitan Water Supply. Mr. Stearns has also served as consulting engineer for various sanitary and other works, is now a director of the American Society of Civil Engineers, and has been President of the Boston Society of Civil Engineers. Mr. Dexter Brackett, M. Am. Soc. C. E., has been appointed as Engineer of the Distribution Department of the above works, and assumed his office Aug. 1. Mr. Brackett has been constantly in the employ of the city of Boston since 1869. Up to 1888 he was connected with the city engineer's office, having charge of water department work, as well as being engaged in general municipal engineering. From 1888 to 1891 he held the position of Superintendent of the Eastern Division of the Boston Water-Works, having charge of the entire distribution system, both construction and maintenance. Since 1891 he has again been connected with the city engineer's office, in charge of water department work, and has had important practice as consulting engineer in the matter of water-works pumping and distributing systems, making preliminary reports for the Metropolitan Water Supply. Mr. Brackett has been President of the New England Water-Works Association, and for many years has been Senior Editor of the "Journal" of that society. He has also been prominently connected with the Boston Society of Civil Engineers. Mr. T. F. Richardson, M. Am. Soc. C. E., has also been appointed on the engineering force of the Metropolitan Water Board. Mr. Richardson will have charge of surveys for the great aqueduct and dam. He was employed as Principal Assistant Engineer of the preliminary investigations for the Metropolitan Water Supply, coming to that work from Chicago, where he had been in charge of one of the lake tunnels of the Chicago water-works. He began his engineering experience on the Sudbury River water supply for Boston in 1873, being employed during the preliminary investigations and construction. He was afterwards engaged in railway work on a number of large Western roads, and was Chief Engineer of the Pike's Peak Ry. He was also engaged on the Chicago Drainage Canal. Mr. William Davenport, Mayor of Marlboro, Mass., has been appointed as secretary of the Metropolitan Water Board. This appointment, with the three engineers named above, fills the most important offices of the Board. The three members of the Board, as previously stated, are Messrs. H. H. Sprague, Wilmot R. Evans and John R. Freeman, M. Am. Soc. C. E.

ENGINEERING SOCIETIES.

COMING TECHNICAL MEETINGS.

ENGINEERING ASSOCIATION OF THE SOUTH.
Aug. 8. Secy., H. D. Ruhm, Nashville, Tenn.

AMER. ASS'N FOR THE ADVANCEMENT OF SCIENCE.
Aug. 28 to Sept. 7. At Springfield, Mass. Secy., F. W. Putnam, Salem, Mass. Local Secy., Wm. A. Webster, Springfield, Mass.

NEW ENGLAND WATER-WORKS ASSOCIATION.
Sept. 11 to 13. At Burlington, Vt. Secy., John C. Whitney, Newton, Mass.

NATIONAL IRRIGATION CONGRESS.
Sept. 16 to 19. At Albuquerque, N. Mex. Secy., Fred L. Alles, Los Angeles, Cal.

NEW ENGLAND ROADMASTERS' ASSOCIATION.
Sept. 18, 19. Secy., M. C. Hamilton, Hartford, Conn.

AMERICAN INSTITUTE OF MINING ENGINEERS.
Oct. 8. At Atlanta, Ga. Secy., R. W. Raymond, New York, N. Y.

ROADMASTERS' ASSOCIATION OF AMERICA.
Oct. 8. At St. Louis, Mo. Secy., W. W. Sharpe, Waycross, Ga.

AMERICAN INT. ASSOC. OF RY. SUPTS. OF BRIDGES AND BUILDINGS.
Oct. 15. At New Orleans, La. Secy., S. F. Patterson, Boston & Maine R. R.; Concord, N. H.

AMERICAN STREET RAILWAY ASSOCIATION.
Oct. 15. At Montreal, Que. Pres., Joel Hurt, Atlanta, Ga.

CONSTRUCTION NEWS.

CONDENSED LIST OF CONTRACTS PENDING WITH DATE OF OPENING BIDS.

Bids to be opened.	Work.	Place.	See Eng. News.
Aug. 2.	Electric lighting.	El Paso, Tex.	May 23
Aug. 2.	Street improvements.	Richmond, Ind.	July 18
Aug. 2.	Sewers.	Cincinnati, O.	July 25
Aug. 2.	Plans for court house.	Paris, Tex.	July 25
Aug. 2.	Asphalt paving.	Brooklyn, N. Y.	July 25
Aug. 2.	Paving.	Camden, N. J.	Aug. 1
Aug. 2.	Asphalt paving, etc.	Rochester, N. Y.	Aug. 1
Aug. 2.	Iron bridge.	Paterson, N. J.	Aug. 1
Aug. 3.	Paving (14,000 sq. yds.).	Mansfield, O.	July 18 Advertised, Eng. News, July 18 and 25.
Aug. 3.	Iron bridge.	Cincinnati, O.	July 18
Aug. 3.	Brick paving.	Cincinnati, O.	July 18
Aug. 3.	Artesian well.	Bushnell, Ill.	July 18 Advertised, Eng. News, July 18.
Aug. 3.	Docks, piers, etc., at Pinners' Pt.	Va.	July 25 Advertised, Eng. News, July 25.
Aug. 3.	Car shop.	Peterboro, Ont.	July 25
Aug. 3.	Sewers (12,500 ft.).	Indianapolis, Ind.	July 25
Aug. 3.	Steel drawbridge.	Hainesport, N. J.	July 25 Advertised, Eng. News, July 25 and Aug. 1.
Aug. 3.	Pipe sewers (22,300 ft.).	Ithaca, N. Y.	July 25 Advertised, Eng. News, July 25.

Aug. 3. Bldg. foundations, E. Cambridge, Mass. July 25
Aug. 3. Repairing public building at Boston....Aug. 1
Aug. 3. Asphalt paving, Wilkes Barre, Pa.....Aug. 1
Aug. 3. Brick paving, etc., Des Moines, Ia.....Aug. 1
Aug. 3. Iron bridge, Galena, Ill.....Aug. 1
Aug. 3. Pipe sewers, Boston, Mass.....Aug. 1
Aug. 5. Levee wk. (700,000 cu.yds.), Rock Island. July 11
Advertised, Eng. News, July 11 to Aug. 1.
Aug. 5. Sewers, Orange, N. J.....July 18
Advertised, Eng. News, July 18 and 25.
Aug. 5. Pumping engine, Jackson, Tenn.....July 18
Aug. 5. Water-wks. system, Morristown, Tenn..July 18
Aug. 5. Water-wks. system, Schaller, Ia.....July 18
Aug. 5. State house work, Topeka, Kan.....July 18
Aug. 5. Highway bridge, Seattle, Wash.....July 18
Aug. 5. Asphalt paving, Syracuse, N. Y.....July 25
Aug. 5. Sewers, Crafton, Pa.....July 25
Aug. 5. Schoolhouse, Providence, R. I.....July 25
Aug. 5. Sea wall at Fort Wayne, Mich.....July 25
Aug. 5. Water-works system, Sellersville, Pa..July 25
Advertised, Eng. News, July 25 and Aug. 1.
Aug. 5. Electric lighting, Dayton, Ky.....July 25
Aug. 5. Bridge approaches, Columbus, O.....July 25
Aug. 5. Street improvements, Streator, Ill.....July 25
Aug. 5. Steel improvements, Streator, Ill.....July 25
Aug. 5. Paving, Crafton, Pa.....July 25
Aug. 5. Cast iron pipe, Port Huron, Mich.....Aug. 1
Aug. 5. Hospital buildings at Sonyea, N. Y.....Aug. 1
Aug. 5. Repairing public bldg., Aberdeen, Miss..Aug. 1
Aug. 5. Pipe sewers, etc., at Sonyea, N. Y.....Aug. 1
Aug. 5. Paving (6 contracts), Albany, N. Y.....Aug. 1
Aug. 5. Grading, Wilmerding, Pa.....Aug. 1
Aug. 5. Brick paving, Belleville, Ill.....Aug. 1
Aug. 5. Cast iron pipe, Brooklyn, N. Y.....Aug. 1
Advertised, Eng. News, Aug. 1.
Aug. 5. Iron bridges (2), Peoria, Ill.....Aug. 1
Aug. 5. Iron bridges (2), Paterson, N. J.....Aug. 1
Aug. 6. Court house, Dublin, Ga.....June 20
Aug. 6. Main sewer, Hammond, Ind.....July 18
Aug. 6. Artesian well, Jerseyville, Ill.....July 18
Aug. 6. Paving, Columbus, O.....July 25
Aug. 6. Sewer, Mount Vernon, N. Y.....July 25
Aug. 6. Sewers, Brooklyn, N. Y.....July 25
Aug. 6. Jail, Toulon, Ill.....July 25
Aug. 6. Pipe, pig lead, etc., Washington, D. C..July 25
Aug. 6. Water-works system, Alexandria, Ont..July 25
Advertised, Eng. News, July 25.
Aug. 6. Street improvement bonds, Milwaukee..Aug. 1
Aug. 6. Laying water pipe, Jersey City, N. J...Aug. 1
Aug. 6. Sewers, Philadelphia, Pa.....Aug. 1
Aug. 6. Cast iron pipe, Jersey City, N. J.....Aug. 1
Aug. 6. Cobblestone paving, Brooklyn, N. Y....Aug. 1
Aug. 6. Filling, Dubois, Pa.....Aug. 1
Aug. 6. Pier repairs, New York, N. Y.....Aug. 1
Aug. 6. Stone abutments, Toronto, Ont.....Aug. 1
Aug. 6. Steel bridge, Bryan, O.....Aug. 1
Aug. 6. Pipe sewers, Troy, N. Y.....Aug. 1
Aug. 7. Street improvement bonds, Toledo, O..July 18
Aug. 7. Boiler house, Cleveland, O.....July 18
Aug. 7. Iron bridge, Frankfort, Ind.....July 18
Aug. 7. Armory building, Tonawanda, N. Y...Aug. 1
Aug. 7. Hydrant covers, etc., Buffalo, N. Y...Aug. 1
Aug. 7. Paving, Buffalo, N. Y.....Aug. 1
Aug. 7. Lumber, iron & paint, Washington, D.C..Aug. 1
Aug. 7. Bridges (5), Los Angeles, Cal.....Aug. 1
Aug. 8. Water-wks. system, Middleville, N. Y..July 18
Advertised, Eng. News, July 18 to Aug. 1.
Aug. 8. B'k pav'g (18,341 sq. yds.), Marion, Ind. July 25
Aug. 8. Asphalt paving, Indianapolis, Ind.....Aug. 1
Aug. 8. Jail work, Newark, N. J.....Aug. 1
Aug. 8. Brick paving, Cincinnati, O.....Aug. 1
Aug. 8. Electric fire alarm, St. Bernard, O.....Aug. 1
Aug. 8. Pipe sewers, Indianapolis, Ind.....Aug. 1
Aug. 9. Brick & granite paving, Louisville, Ky. Aug. 1
Aug. 9. Public building, Pittsburg, Pa.....Aug. 1
Aug. 9. Electric lights, Louisville, Ky.....Aug. 1
Aug. 9. Electric light plant, Windom, Minn....Aug. 1
Aug. 9. Cement sidewalks, Rochester, N. Y....Aug. 1
Aug. 10. Paving, Springfield, Ill.....July 18
Aug. 10. Brick hospital building, Columbus, O..July 25
Aug. 10. Electric light plant, Bardstown, Ky...Aug. 1
Aug. 10. Bridge, Cincinnati, O.....Aug. 1
Aug. 11. Repair'g asphalt pavements, St. Louis. Aug. 1
Aug. 12. Building addition, Los Angeles, Cal....June 27
Aug. 12. Bridge, Rock Island, Ill.....July 11
Aug. 12. Electric wiring, Dallas, Tex.....July 25
Aug. 12. Plans, high school bldg., Providence...July 25
Aug. 12. Plans for school bldg., Toledo, O.....July 25
Aug. 12. Laying water pipe, Knoxville, Ill.....July 25
Advertised, Eng. News, July 25.
Aug. 12. Brick paving, Michigan City, Ind.....Aug. 1
Aug. 12. Boilers (4), Buffalo, N. Y.....Aug. 1
Aug. 12. Paving, Camden, N. J.....Aug. 1
Aug. 12. Improving bridge, Jersey City, N. J...Aug. 1
Aug. 12. Office building, Toronto, Ont.....Aug. 1
Aug. 13. Brick sewer, Indianapolis, Ind.....July 18
Advertised, Eng. News, July 18 and 25.
Aug. 13. Jail, Houston, Tex.....July 18
Aug. 13. Asphalt paving, Indianapolis, Ind.....July 25
Aug. 13. Public building, Chester, Pa.....July 25
Advertised, Eng. News, July 25 and Aug. 1.
Aug. 13. Paving, Columbus, O.....Aug. 1
Aug. 13. Paving, North Tonawanda, N. Y.....Aug. 1
Advertised, Eng. News, Aug. 1 and 8.
Aug. 13. Dredging, New Bedford, Mass.....Aug. 1
Advertised, Eng. News, Aug. 1 and 8.
Aug. 14. Asphalt paving, Hoboken, N. J.....July 25
Aug. 14. School building, Baltimore, Md.....Aug. 1
Aug. 14. Addition to museum bldg., New York. Aug. 1
Aug. 15. Brick paving, Pontiac, Ill.....July 18
Advertised, Eng. News, July 18 and 25.
Aug. 15. Water bonds ($200,000), Cleveland, O. July 18
Aug. 15. Rebuilding pump. mach'ry, Cleveland..July 25
Aug. 15. Asphalt paving, Peoria, Ill.....Aug. 1
Advertised, Eng. News, Aug. 1 and 8.
Aug. 15. Water-works system, Montpelier, O...Aug. 1
Advertised, Eng. News, Aug. 1 and 8.
Aug. 15. Pumping engine, Owatonna, Minn.....Aug. 1
Aug. 15. Steel bridge, Winnipeg, Man.....Aug. 1
Aug. 15. Public building, New London, Conn....Aug. 1
Advertised, Eng. News, Aug. 1 and 8.
Aug. 15. Fire alarm telegraph, Carbondale, Pa..Aug. 1
Aug. 15. Irrigation bonds, Walworth, Neb.....Aug. 1
Aug. 15. Water-wks. system, Lebanon, O.....Aug. 1
Advertised, Eng. News, Aug. 1 and 8.
Aug. 16. Plans for school building, Buffalo, N. Y. July 18
Aug. 16. Brick paving, Cincinnati, O.....July 25
Aug. 16. Electric light bonds, Mankato, Minn...Aug. 1
Aug. 16. Water bonds ($19,500), Garrett, Ind...Aug. 1
Advertised, Eng. News, Aug. 1 and 8.
Aug. 16. Water bonds, West Carrollton, O.....Aug. 1
Aug. 18. Repairing public building, Cleveland, O. Aug. 1
Aug. 19. Electric wiring, Toledo, O.....Aug. 1
Aug. 19. Brick pav'g (22,000 sq. yds.), Warren, O...Aug. 1
Aug. 19. Steam tug, New York, N. Y.....Aug. 1
Aug. 20. Capitol building, Olympia, Wash.....June 20
Aug. 20. Steel highway bridge, Warren, Pa.....July 25
Advertised, Eng. News, July 25 and Aug. 1.
Aug. 20. Sewer system, Logan, O.....July 25
Advertised, Eng. News, July 25 and Aug. 1.
Aug. 20. Paving bonds, Springfield, O.....Aug. 1
Aug. 20. Library building, Kansas City, Mo.....Aug. 1
Aug. 20. Bridge abutments, Lock Haven, Pa....Aug. 1
Aug. 20. Museum building, Brooklyn, N. Y.....Aug. 1
Aug. 20. Sewer, Mount Vernon, N. Y.....Aug. 1
Aug. 20. Cast iron pipe, Hoboken, N. J.....Aug. 1
Aug. 21. Dredging in Indian River, Fla.....July 25
Advertised, Eng. News, July 25 to Aug. 15.
Aug. 26. Hospital buildings, Bangor, Me.....July 25
Aug. 26. Electric lighting, Collinwood, O.....Aug. 1
Aug. 30. Timber (60 sq. miles), Ottawa, Ont....July 11
Aug. 30. Plans for school bldg., Buffalo, N. Y..Aug. 1
Sept. 2. Electric light plant, Canton, Miss.....July 25
Advertised, Eng. News, July 25 and Aug. 1.
Sept. 2. Water-works system, Canton, Miss....July 25
Advertised, Eng. News, July 25 and Aug. 1.
Sept. 2. Water-works franchise, Canton, Miss..July 25
Advertised, Eng. News, July 25 and Aug. 1.
Sept. 3. Prison labor to let, Michigan City, Ind. Aug. 1
Sept. 5. State capitol plans, St. Paul, Minn....July 11
Sept. 6. Court house, South Bend, Ind.....July 25
Sept. 10. Plans for city hall, Worcester, Mass...July 18
Sept. 10. Water-wks system, Grand Junction, Colo. Aug. 1
Advertised, Eng. News, July 18 to Aug. 8.
Sept. 14. Plans for library bldg., Madison, Wis..July 18
Sept. 18. Water-wks. franchise, Butte, Mont....July 11
Advertised, Eng. News, July 11 to Aug. 8.
Oct. 1 Plans for art building, Philadelphia, Pa..May 23
Advertised, Eng. News, May 23 to June 27.
Oct. 1. Composite gunboats, Washington, D. C. Aug. 1
No date. Drain, Napier, Ont. .....Aug. 1

RAILWAYS.

East of Chicago.

EAST LIVERPOOL & LISBON.—The Lisbon, O., "Patriot" states that Wm. Jute, John Sweeney and others, of Pittsburg, Pa., have secured a charter in Ohio for a railway from East Liverpool, where a new bridge is to be built across the Ohio River, to Lisbon, a distance of 16 miles. The surveys are completed for the railway.

NEW YORK & PENNSYLVANIA.—Incorporated in New York July 22 to build a steam railway, beginning at the state line in the town of Willing, near the village of Genesee, Allegany county, to the Canisteo Valley, in the town of Hornellsville, Steuben county, a distance of 30 miles; capital stock is $300,000; directors, Theodore Cobb and William Cobb, of Springville; M. S. Chase, of Whitesville; J. N. Pack, of Coudersport, Penn.; W. W. Crittenden, of Oswego; G. M. Webster, of Greenwood; William Richman and B. M. Connell, of Hornellsville, and William G. Porter, of Canisteo. The company's principal office will be in Hornellsville. At a meeting of the directors at Hornellsville, N. Y., July 25, it was voted to build at once to Rexville, Steuben county, and continue the line to Hornellsville only on condition that $50,000 is subscribed by that city to the capital stock. It is stated that all but $18,000 of this has already been raised. This road is the proposed extension of the Olean, Oswayo & Eastern, noted several times in these columns.

PITTSBURG & EASTERN.—It is reported that a contract was awarded July 19 for building an additional 45 miles of this railway. S. H. Hicks, Vice-Pres., is quoted as stating that the road will be completed to Salisburg before winter.

PITTSBURG, CINCINNATI, CHICAGO & ST. LOUIS.—Pittsburg, Pa. papers state that work was begun July 22 by S. Casparis, of Columbus, O., on the contract for completing the double track of this road between Columbus and Pittsburg. About 400 men are now employed, and will work night and day. The work necessary to complete the 193 miles of double track includes the widening of two tunnels and grading of several miles of roadbed. Telegraph stations will be established at both ends of each tunnel, to guard against accident, nearly 200 trains having to pass through the tunnels daily. The work included in the contract will cost about $300,000.

PORTLAND EXTENSION.—This company has been organized in Maine to build an extension from Westbrook to Gorham, Me., four miles. The directors are William G. Davis, W. R. Wood, C. F. Libby, of Portland, Me.; E. A. Newman, of Deering; H. N. Wheeler, of Brooklyn. The state railroad commissioners have been asked to approve the location, and if granted work will commence at once.

SEBASTICOOK & MOOSEHEAD.—The directors of this company voted July 26 to extend the road to Harmony, Me., as soon as possible, which will bring the line with 15 miles of the Bangor & Aroostook. The capital stock will be increased from $126,000 to $180,000. Pres., Z. D. Lancaster, Fredericton, N. B.

UNADILLA VALLEY.—This railway was formally opened July 25. The line extends from Bridgewater to New Berlin, N. Y., 20 miles.

WASHINGTON COUNTY.—A press report states that at the election July 29, Washington county, Me., unquestionably voted in favor of the county subscribing for $500,000 worth of preferred stock of the Washington County R. R. Co., fomerly called the Shore Line. The road runs from Calais and Eastport to a point on the Maine Central, near Ellsworth. Calais voted 1,193 for and 21 against, and in 18 principal towns the vote was: Yeas, 3,032; nays, 394. This is said to assure an early completion of this long-deferred project.

WEST SIDE BELT LINE.—It is reported that this company has been organized at Pittsburg, Pa., to build a line 20 miles long, from Saw Mill Run, Allegheny county, to Monongahela City, Washington county; capital stock, $200,000. The road will form a link of the Pittsburg & Eastern, a new trunk line.

Southern.

JACKSONVILLE, ST. AUGUSTINE & INDIAN RIVER.—The contract for the extension from West Palm Beach south to Miami, Fla., 66 miles, is said to have been awarded to Louis McLain, of West Palm Beach, Fla. Ch. Engr., E. Ben. Carter, Jacksonville.

JACKSONVILLE & TAMPA BAY.—T. J. Appleyard, Secy., Sanford, Fla., is quoted as stating that surveys will be commenced at once for this railway, and contracts for the construction awarded as soon as possible. The line when completed, exclusive of branches, will be 245 miles in length. The company has a very liberal charter and a land grant of 5,000 acres to the mile, which is to be deeded to the company as fast as each five miles is graded, tied and ironed. Their charter gives the right to build feeders to the main line in any direction.

MONTGOMERY, HAYNEVILLE & CAMDEN.—Surveys for this projected railway were commenced July 22 under the direction of John A. Milner, of Birmingham, Ala. The road will extend from Camden to Montgomery, 80 miles, and it is stated that all the towns along the route have voted assistance.

PENINSULA CONSTRUCTION CO.—The organization of this company at Baltimore, Md., to build the projected Queen Anne Railway was noted last week. It is stated that contracts will be awarded this week for the construction. Pres., W. H. Bosley, Baltimore, Md.

PENSACOLA & NORTHERN.—Bids are being received, according to press reports, for grading the first 25 miles of this railway, which is projected from Eutaw, Ala., to Pensacola, Fla., 212 miles. Pres., S. N. Van Praag, present address, Arlington Hotel, Memphis, Tenn.

SOUTHPORT & WESTERN.—E. B. Stevens, Vice-Pres., Southport, N. C., writes us that the projected length of this railway is 300 miles, passing through Conway to Greenville, S. C. Several of the townships along the route have voted $50,000 in subscriptions, and the surveys will be commenced at an early date. Chicago parties are furnishing the capital.

VIRGINIA, FREDERICKSBURG & WESTERN.—A press report from Fredericksburg, Va., states that the counties in the northern neck of Virginia have voted aid to this road, and that the construction was commenced July 26.

WEST VIRGINIA SOUTHERN.—Herndon & Renshaw, Charleston, W. Va., write us that the contract for building the first five miles of this railway was let July 26, tracklaying and all ready for locomotive, to Gouch, Rinehart & Co., of Covington, Va., they to finish the work by November, 1895. The charter of the company gives it the right to build through the Coal River coal fields, a distance of about 150 miles, opening up one of the largest, if not the largest, coal fields in the United States. Engrs., Venable & Vance, Charleston.

Northwest.

BELMONT & NORTH PLATTE VALLEY.—Incorporated in Nebraska July 25, with a capital stock of $1,000,000, by John A. McShane, Frank C. Condon, C. B. Rustin, Louis Schroder and B. L. Baldwin.

BRAINERD & NORTHERN MINNESOTA.—The construction of the extensions of this road is progressing rapidly, according to reports. About 900 men are now at work. It is stated that later on the main line will be extended. Ch. Engr. and Supt., F. W. Kimball, Brainerd, Minn.

CHICAGO, IOWA & MINNESOTA.—This company has been organized at Eldora, Ia., and has secured a 60-days' option on the Chicago, Iowa & Dakota road, now in operation from Eldora Junction to Alden, Ia., 27 miles. Pres., E. S. Ellsworth, Chicago; Vice-Pres., John Porter, Eldora, Ia.; Secy., M. Furry,

HAMPTON, CLARION & WESTERN.—This company has been incorporated in Iowa to build a railway from Hampton, Ia., the western terminus of the Chicago Great Western, west through Clarion. Press reports state that this will probably become a link in the long-reported extension of the Chicago Great Western to Sioux City.

MASON CITY & FORT DODGE.—This company is reported as negotiating for the old Northwestern right of way and bridge across the Coon River at Jefferson, Ia., and will extend its line to Council Bluffs.

MILWAUKEE & LAKE WINNEBAGO.—This company has filed an amendment to its articles of incorporation, providing for an additional issue of $1,280,000 worth of stock, and for the construction of a railway from Neenah in an easterly direction to Menasha and thence to Manitowoc, Wis., in all a distance of 45 miles. This is a part of the Wisconsin Central system, and evidently indicates that the construction of the projected line to Manitowoc will be commenced at an early date.

OMAHA & SIOUX CITY.—Incorporated in Nebraska July 23 to build a railway between Omaha and Covington, Neb. (opposite Sioux City, Ia.); capital stock, $1,200,000; H. B. Fuller, Michael Vincent, E. D. Caulfield, Jas. P. Latta and E. C. Houston.

PEORIA & ILLINOIS VALLEY.—A press report from Princeton, Ill., states as follows: The project for constructing a railway from Bureau to Peoria by way of Hennepin and the east shore of the Illinois River that was started about 20 years ago and abandoned after an expenditure of about $100,000 has been revived, and two corps of engineers under Capt. George Wightman, Ch. Engr., are at work laying out the route from Hennepin south. Another party is securing options on a right of way, and this, it is said, has been secured already for a distance of 30 miles. The new company is the one that last winter obtained from Congress a permit to bridge the Illinois River at Hennepin, the preliminary surveys of which have already been made. From the east side of the river to Bureau the old grading that was thrown up 30 years ago will be used, which will save a great amount of expense. This road, whose ultimate destination is Chicago, is intended to serve a strip of country that now relies upon the Illinois River for carrying supplies, and where much inconvenience is experienced in the winter months. The several townships along the route will be asked to vote a bonus, but this will be given upon many conditions, as the same townships 30 years ago gave bonds in sums averaging $50,000 each to the railway company, which they were obliged to pay, notwithstanding that the railway was never in actual operation.

TERRE HAUTE, SAYLOR SPRINGS & MOUNT VERNON.—A press report from Saylor Springs, Ill., states that Dr. B. F. Sciefe, Pres., returned to that city July 26, having completed a trip along the proposed line from Mount Vernon, in company with Horace C. Pugh, Gen. Man., of Terre Haute, Ind. President Sciefe states that all the financial arrangements have been completed, and that the contract has been let for the construction of the line in Illinois from Mount Vernon to the Indiana state line, work to commence at once. R. H. Cole, Ch. Engr. will establish his headquarters at Mount Vernon, and will prepare the line for the subcontractors as fast as possible. It is the intention of the company to push the construction of the road so as to have it in operation before this time next year.

WASHBURN, IRON RIVER & WESTERN.—This

company filed an amendment to its articles of incorporation July 26 to allow it to build an extension from Iron River southerly towards Drummond, Wis., a distance of 12 miles.

Southwest.

CHESTER, FARMINGTON & WESTERN.—Col. Richard Southerd, Ch. Engr., is reported as stating that the contract for grading 70 miles has been let to O'Connor & Dowling, who have sublet the work in 3-mile and 5-mile sections to Messrs. Scott, Bethune, O'Neill, Chase, Webb, Martin and others. The chief engineer will soon have 50 miles more ready to let. It is proposed to build a railway directly west about 300 miles to Fort Scott, Kan., starting like a Y at Clearyville, Mo., opposite Chester, Ill., and Little Rock Landing, Mo., two miles north of Ste. Genevieve and 20 miles from Clearyville. It is expected that the line from Clearyville to Bismarck and Irondale, about 70 miles, will be in operation by Jan. 1, 1896. Pres., A. J. Cooper, Chicago; Treas., Thos. A. Stoddard, Cashier Third National Bank, St. Louis; Secy., W. M. Hough, St. Louis. General offices in Rialto Building, Chicago.

ST. LOUIS, KANSAS CITY & COLORADO.—An occasional correspondent (who will favor us very much by sending us his complete address) writes us as follows: The St. Louis Construction Co. has the contract from the Atchison, Topeka & Santa Fe R. R. Co. to build the St. L., K. C. & C. R. R. from Union, Mo., to Shelby, by way of Koeltztown, Versailles and Sedalia. S. Y. Emerson is chief engineer, and the following-named men compose the construction company: Quigly, of Sedalia; Keene, of St. Louis; Drew, of Indianapolis; Wiggins, of Chicago, and Moulton, of St. Louis. The distance is 196 miles. Work will commence right away. There is considerable rock work, and the road is to be completed by July 1, 1897.

Rocky Mt. and Pacific.

COLORADO, UTAH & WYOMING.—This company filed articles of incorporation at Cheyenne, Wyo., July 20, with a capital stock of $5,000,000.

SAN FRANCISCO & SAN JOAQUIN VALLEY.—Grading on this railway was commenced at Stockton, Cal., July 19, by R. R. Thornton & Co., and it is expected that the contract for grading the line between Stockton and Stanislaus River, 26 miles, will be awarded this week. Ch. Engr., W. R. Storey, Jr., 321 Market St., San Francisco.

SEATTLE, VAUGHN & OLYMPIA.—We are informed that the Seattle, Vaughn & Olympia Ry. & Navigation Co. will build a railway from Vaughn to Colby, across the peninsula. A fast boat will be put on between Olympia and Vaughn, and also between Colby and Seattle, making the time for the whole distance of 52 miles, 2 hours and 25 minutes, or one-half the time of the Northern Pacific, the all-rail route, and one-third the time of the all-water route. Pres., E. G. Edrington, Seattle, Wash.

SUNDANCE MINING, COAL & R. R. CO.—This company has been incorporated in Wyoming with capital stock of $200,000, to develop the coal fields of Crook and Weston counties, and to build a railway into the fields. Pres., Attorney General B. F. Fowler, of Cheyenne, Wyo.; Vice-Pres., Alva Hoyt, of Sundance, Wyo.; Treas., J. B. Reynolds, Omaha, Neb.

STREET AND ELECTRIC RAILWAYS.

PORTLAND, ME.—The Portland Extension R. R. Co. has been organized to build an electric railway from the terminus of the Portland R. R. in Saccarappa, Westbrook, to Gorham. Directors, Wm. G. Davis, Wm. R. Wood, and Chas. F. Libby, of Portland; Edward A. Newman, of Deering, and William Wheeler, of Brooklyn, N. Y.

WINOOSKI, VT.—The Winooski & Fort Ethan Allen Ry. Co. is considering the question of extending its electric road to Burlington and to Mallett's Bay. Directors, F. C. Kennedy, C. W. Brownell, M. A. Bingham, and others, of Burlington.

FALL RIVER, MASS.—The Fall River St. Ry. Co. has been incorporated, with a capital stock of $50,000; directors, Wendell E. Turner, Arnold B. Sanford, David Beattie, J. E. Osborn, and others.

MILFORD, MASS.—The Milford & Medway St. Ry. Co. has been incorporated, to build an electric railway six miles in length; capital stock, $100,000; incorporators, G. M. Greene, of Milford; L. S. Daniels, of West Medway, and Henry A. Clark, of Medway.

NEWTON, MASS.—The Wellesley & Boston St. Ry. Co. has been incorporated to build an electric railway from West Newton to Wellesley, a distance of three miles; capital stock, $40,000; incorporators, Horace B. Parker, of Newtonville; Geo. W. Morse, of Newton, and Frederick Johnson, of Auburndale.

NORFOLK, MASS.—It is reported that the Norfolk Suburban St. Ry. Co. has voted to extend its electric road to Forest Hills from Dedham, by way of Germantown, West Roxbury, Roslindale, and Mount Hope, and its Mattapan branch to Milton Lower Mills, connecting with the West End St. Ry. on Dorchester Ave.

HARTFORD, CONN.—Press reports state as follows: The company which is to connect Hartford with New Britain by an electric road is the Newington Tramway Co. The road will be built under a charter granted in 1893, which would have expired on June 29. On June 28 the company was organized and accepted its charter. It is claimed that the new road will not parallel either the New York & New England, or the Consolidated road. It is expected to have the road built by next spring. Pres., F. G. Breed, Supt. Gen. Ry. & Electric Co., of New Britain.

THOMPSONVILLE, CONN.—The Enfield & Longmeadow Electric Ry. Co. has been organized; capital stock, $200,000; directors, C. H. Briscoe, Geo. B. Fowler, L. A. Upson and J. W. Johnson. Press reports state as follows, concerning this road: The road when completed will eventually extend from the Massachusetts state line to a mile south of Warehouse Point. There is some talk of extending the line across the Suffield and Thompsonville bridge, and along River St. to the Massachusetts state line, on the west side of the river, and over Suffield to Dunn's Corner, and probably in the future it will connect with the Hartford and East Hartford road. It is hoped that the Springfield railway will be extended south to the Connecticut line, connecting with this road.

AUBURN, N. Y.—The Auburn Inter-Urban Electric R. R. Co. has been incorporated to build a road to connect Auburn with Port Byron, Throopsville, Weedsport, Skaneateles and Island Park on Owasco Lake; capital stock, $250,000; incorporaotrs, Edwin F. Voris, Geo. C. Kohler, and L. S. Ebright, of Akron, O.; J. J. Smith, of Cincinnati, O., and H. V. S. Lord, Geo. B. Turner and S. E. Bell, of Auburn, and others.

NEW YORK, N. Y.—The committee of the board of aldermen has been petitioned by the Twenty-eighth & Twenty-ninth Sts. Ry. Co. for permission to extend its road from 13th Ave. to connect with the 23d, 14th and Little Tweifth St. ferries.

RICHFIELD SPRINGS, N. Y.—The Little Falls & Richfield Springs Ry. Co., and the Richfield Springs & Schuyler Lake Ry. Co., the former to build an electric road 18 miles long from Little Falls to Richfield Springs, and the latter, one mile long, from Richfield Springs to Schuyler Lake, in the town of Richfield, Otsego county, have been incorporated. The Little Falls & Richfield Springs Ry. Co. has a capital stock of $200,000, and the Richfield Springs & Schuyler Lake Ry. Co. a capital stock of $20,000. The boards of directors of the two companies are identical, comprising Caleb L. B. Tylee, Frank H. Viele, George E. Tylee, Edwin J. Carpenter, John L. Miller and Thomas J. Mack, of Corning; Theodore C. Bates and William H. Tylee, of Worcester, Mass., and H. Arthur Sillsbee, of New Bedford, Mass.

ELIZABETH, N. J.—It is reported that the Consolidated Traction Co., of Jersey City, is preparing to extend its electric road from this city to Roselle, Cranford, Westfield, Fanwood and Plainfield. Electrical Engr., C. F. Uebelacker.

DUNMORE, PA.—The Dunmore Electric St. Ry. Co. was incorporated July 29 with a capital stock of $75,000; Pres., P. J. Horan.

JENKINTOWN, PA.—The Jenkintown & Fox Chase Electric Ry. Co. was incorporated July 30 to build a road between this place and Fox Chase, ward 35, Philadelphia; capital stock, $20,000, with $2,000 paid in; incorporators, Howard Fleck, Samuel L. Schively, James Satterthwaile and Howard Noble, of Jenkintown, and Wm. P. Longstretch, of Fox Chase.

PHILADELPHIA, PA.—The Fairmount Park Transportation Co. has been granted a franchise to construct an electric railway.

PITTSBURG, PA.—The Munhall St. Ry. Co. was incorporated July 29 to build an electric road in Mifflin township; capital stock, $3,000; Pres., Albert L. Schultz, of Pittsburg.

RANKIN, PA.—The Rankin St. Ry. Co. has been incorporated to build an electric railway; capital stock, $3,000; Pres., Albert L. Schultz, of Pittsburg.

RANKIN, PA.—The Wilkinsburg & Rankin St. Ry. Co. was incorporated July 29 to build an electric road eight miles in length; capital stock, $24,000; Pres., Albert L. Schultz, of Pittsburg.

BALTIMORE, MD.—It is reported that the Columbia & Maryland Electric Ry. Co. is receiving bids for building a double-track railway between Baltimore and Washington. Pres., T. M. Lanahan, Rialto Bldg., Baltimore.

BALTIMORE, MD.—It is proposed to construct an electric railway, with branches over the following routes: Washington to Gettysburg, through Cooksville, Sykesville, Westminster and Union Bridge, a distance of 75 miles. Cooksville, eastward, on the Frederick turnpike, to Ellicott City, and thence to Baltimore, a distance of 22 miles. Eldersburg, Carroll county, eastward on the Liberty turnpike to Gwynn Oak Park, connecting there with the Baltimore Traction Co. lines, a distance of 22 miles. Westminster, eastward to Reisterstown, 12 miles, connecting there with the Baltimore & Emory Grove Electric Ry., recently completed, a distance to Baltimore of 28 miles. Alex. D. Anderson., Glover Bldg., Washington, and Frank Brown, Pres. Baltimore Traction Co., are interested.

WASHINGTON, D. C.—Press reports state as follows: It is announced that work will begin at once on the construction of the Washington & Baltimore Boulevard Electric Ry., bids for the construction of which were opened last Saturday. W. K. Shoepf, manager of two local street railways, has resigned that position to become manager of the proposed Boulevard road. Henry T. Douglas, Cy. Comr. of Baltimore, will resign to become engineer of the new line. The project is one of the Wiedner-Elkins syndicate, and the road will find entrance into the two cities over lines already operated by it. The road will be about 40 miles long, and it is proposed to have it completed next summer.

SOUTHERN PINES, N. C.—James W. Tufts, of Boston, who recently purchased 5,000 acres of land in Moore county, N. C., near Southern Pines, on which he is building several hundred houses to be occupied by indigent consumptives from the North, informs our correspondent that he is considering the plan of establishing a street railway service between the town of Southern Pines and his new town, a distance of five or six miles. The kind of motive power has not yet been decided upon. Mr. Tufts, or John T. Patrick, of Southern Pines, can be applied to for particulars.

AUGUSTA, GA.—It is reported that the Augusta Ry. Co. is about to extend its electric road to Lake Olmstead. Supt. and Electrician, W. E. Moore.

BRUNSWICK, GA.—W. A. Jeter and A. H. Lane have applied for a franchise for an electric railway about 25 miles in length.

ST. AUGUSTINE, FLA.—Geo. H. Packwood, Ocean View Hotel, and T. J. Appleyard, of Tallahassee, are interested in the projected electric belt railway.

NEW ORLEANS, LA.—The Chalmette R. R. Co. has been organized to build an electric railway from Canal St. to Chalmette and St. Bernard Parish; capital stock, $100,000; Pres., Henry T. Beauregard; Vice-Pres., R. V. Ducros; Secy., J. D. St. Alexandre.

CHATTANOOGA, TENN.—It is stated that the extension of the Chattanooga Electric Ry. is contemplated from this city to Roseville, Ga. Receiver, S. W. Divine; Gen. Supt., W. L. McCall.

CLEVELAND, O.—The Cleveland Electric Ry. Co. is considering the question of removing its car houses and other buildings, now located near the entrance to Lake View Cemetery, in East Cleveland. Gen. Supt., J. J. Stanley.

INDEPENDENCE, MO.—Walton Holmes, C. F. Morse and others have been granted a franchise for an electric railway in Main St. and Alton Ave.

HILLSBORO, TEX.—The Hillsboro St. Ry. Co. is contemplating the construction of an electric road at once. Pres., J. H. Graham, of Boston; H. W. Carter, of Hillsboro, and H. T. Voss, of Atlanta, Ga., are interested.

ELECTRIC LIGHT AND POWER.

SHELBURNE FALLS, MASS.—The question of constructing an electric light plant, the power to be secured from the Franklin mills, which will probably be purchased, is being considered. Rufus Covell, Herbert Newell and Geo. H. Wilkins have been appointed a committee to investigate the subject.

SPRINGFIELD, MASS.—Press reports state that the United Electric Light Co. has voted to build a new power house at Indian Orchard to cost about $150,000. At present the company gets about 600 HP. By the new plant it is proposed to put in machinery to use water power sufficient to produce 1,800 HP., which will be brought to this city.

BATAVIA, N. Y.—G. W. Archer, J. Amstice and Frank Westcott, of Batavia, have applied for a franchise for an electric light plant.

FLUSHING, N. Y.—The question of lighting this place by electricity is being considered.

GREENSBORO, N. C.—The Revolution Cotton Mills Co. and the Prosperity Mfg. Co., which are about to begin the erection of two new cotton mills at this place, will include an electric light plant as a part of the equipment of each mill. Moses Cone, of New York, is one of the stockholders in both companies. It is probable that the other new cotton mills noted under Manufacturing Plants will also include electric light plants as a part of their equipment.

MADISON, N. C.—It is reported that plans and specifications will soon be asked for building a masonry dam and putting in turbine wheels. J. H. Ruffin.

RALEIGH, N. C.—John C. Drury is reported as receiving bids for building a masonry dam, with necessary gates, sluice ways, valves, etc., for a one-story power station of brick or stone, to contain set of turbine water-wheels for utilizing the water power.

BARDSTOWN, KY.—Bids are asked until Aug. 10, according to reports, for the installation of an electric lighting plant. Address the Record Printing Co.

LOUISVILLE, KY.—Bids are asked until Aug. 9 for erecting arc and incandescent lights. J. Henry Hoertz, Secy. Bd. Pub. Wks.

KNOXVILLE, TENN.—It is reported that the East Tennessee Telephone Co. is contemplating the erection of an electric lighting plant to furnish arc and incandescent lights for the city, also the establishment of a telephone exchange.

BLOOMVILLE, O.—It is reported that the question of putting in an electric light plant and water-works is being considered.

COLLINWOOD, O.—Bids are asked until Aug. 26 for furnishing 40 arc lights. I. A. Wilson, Village Clk.

TOLEDO, O.—Bids are asked until Aug. 19 for installing electric light wires, etc., in the new Lucas county court house. Arch., D. L. Stine; E. P. Roberts & Co., Electrical Engrs.; Chas. H. Jones, County Audr.

CASSOPOLIS, MICH.—F. C. Rheubottom and W. H. Bond, of Union City, are interested in a projected electric light plant at this place.

DETROIT, MICH.—The Log Cabin Farm Syndicate is reported as considering the question of building an electric light plant. Secy., Cameron Caine, 82 Griswold St.

FLUSHING, MICH.—Specifications have been completed for an electric light plant and water-works, and it is stated that the contract will be awarded about Aug. 20.

CUBA, ILL.—An election has been called for Aug. 10 to vote on the question of issuing bonds for an electric light plant.

BRAINERD, MINN.—It is reported that C. N. Parker, of the Brainerd St. Ry. Co., and E. C. Gibson, of Chicago, Ill., are interested in a projected dam for improving the water power, and for consolidating the Brainerd electric railway, the water power, telephone system, and the electric lighting plant into one company, to be known as the Brainerd Public Works Co.

MANKATO, MINN.—Bids are asked until Aug. 16 for the purchase of $10,000 of 5% electric light bonds. Calvin Smith, Cy. Recdr.

WINDOM, MINN.—Bids are asked until Aug. 9 for the construction of an electric light plant. Engr., Chas. F. Loweth, 94 East 4th St., St. Paul; F. W. Force, Recdr.

ST. LOUIS, MO.—The city counsellor has been directed to prepare an ordinance authorizing the city to erect an electric light plant.

NEW WHATCOM, WASH.—The installation of a municipal electric light plant, at an estimated cost of $12,000, is being considered by the council. About 100 arc and 2,000 incandescent lights will be required, according to reports.

LOS ANGELES, CAL.—The "Herald" states that the Kern River & Los Angeles Electric Power Co., formed for the purpose of developing and transmitting the power of Kern River, is actively prosecuting the development of its plans. H. Hawgood, Consult. Engr., Bradley Bldg., has been retained by the company, and he already has an engineering party in the field under F. H. Olmsted, to determine the most feasible route for the 105-mile transmission line between Kern River and this city. The enterprise contemplates developing and transmitting from 10,000 to 40,000 HP., and will be one of the largest plants of the kind in the United States. The plant recently installed at Folsom generates about 6,200 HP., 5,000 of which are transmitted 19 miles to Sacramento at a tension of 11,000 volts.

NEW COMPANIES.—Yankton General Electric Co., Yankton, S. Dak.; $50,000; H. T. Nation, London; Henry Eller, H. G. B. Swinhoe, Yankton.

Electric Cotton Mill Co., Athens, Ga.; $50,000; J. J. McMahon, G. P. Johnson.

Asbestos Insulation Co., Baltimore, Md.; $50,000; Chas. W. Logan, John F. Green.

Iron River Electric Light, Power & Telephone Co., Iron River, Wis.; $20,000; Warner S. Carr, Byron Ripley, O. H. Campbell.

Neff Air Power, Water-Works & Fire Extinguisher Co., Fort Wayne, Ind.; $100,000; E. Neff, J. J. Becknell, Preston F. Miles, Milford, Ind.; Charles Pope, Fort Wayne.

The Maine Water & Electric Power Co., Auburn, Me.; to build a dam 200 ft. long to supply 6,886 HP. from the Sheepscot water power, 12 miles from Au-

burn; W. Doe, H. L. Ingalls, A. M. Card, and J. H. Link.

Citizens' Telephone & Electric Co., Hoboken, N. J., and New York, N. Y.; $50,000, with $20,000 paid in; Incorporators, Wm. H. Ellis, John Ryan, Hoboken; Morris Frankford, New York; John J. Cuddiley, Hoboken.

BRIDGES.

LOWELL, MASS.—The committee is considering the question of building a bridge 60 ft. wide at Moody St., at an estimated cost of about $75,000.

HARTFORD, CONN.—The chairman of the bridge commission, ex-Governor Buckely, has been directed to secure plans for a new iron bridge over the river and for iron bridges along the causeway leading from it.

TROY, N. Y.—The following bids were received by the contract board July 23 for building the viaduct over the Fitchburg R. R. tracks at Rensselaer St.; Secy., E. O. Ross: Steel superstructure—Wrought Iron Bridge Co., Canton, O., (awarded contract), $14,920; Hilton Bridge Co., Albany, N. Y., $17,950. Substructure—Troy Public Works Co., Troy, N. Y., $9,623; John H. Gardner, Troy, N. Y., $9,270; Hilt & Pidgeon, Albany, N. Y., $8,286; J. H. Cavanaugh, Troy, N. Y., $9,984, $9,544; Cunningham, Monty & Co. (awarded contract), Albany, N. Y., $6,693.

JERSEY CITY, N. J.—Bids are asked until Aug. 12 for replacing about 4,500 sq. ft. of planking, and taking out and replacing 10 new caps, 11 oak fenders, piles, etc., for the Paterson Plank road bridge over the Hackensack River. Frank McNally, Chn. Joint Com.

JERSEY CITY, N. J.—It is reported that the street and water commissioners have approved plans and specifications for the extension of 13th St. from Coles St. to Hoboken Ave. A viaduct 300 ft. in length will be constructed, and the cost of the improvement is estimated at $60,000.

PATERSON, N. J.—Bids are asked until Aug. 2 for erecting a one-span bridge at West 27th St. and Stony Road, and until Aug. 5 for building an iron bridge over the Passaic River from Fifth St. to Manchester township, and for building an iron bridge over the brook on the Otter Hole Road in West Milford township. Arthur W. Bishop, Chn.; A. B. Pearce, Clk. Bd. Supervisors.

ALLEGHENY, PA.—The Allegheny & Chartiers Valley Bridge Co. has been incorporated to build a toll bridge over the Ohio River from Espen to this city; capital stock, $5,000, with $500 paid in; Treas., Miller Elliott, of Pittsburg.

HAMBURG, PA.—The county commissioners are considering the question of constructing a bridge 70 ft. in length over the Saucony River in Greenwich county, between Greenwich and Richmond.

LOCK HAVEN, PA.—Bids are asked until Aug. 20 for constructing abutments for the proposed bridge in Porter township, near Kryders Siding. C. W. Loveland, Clk. Comrs. Clinton County.

PITTSBURG, PA.—E. M. Bigelow, Dir. Pub. Wks., received the following bids July 27 for building a bridge over Panther Hollow: The Shultz Bridge Co. (awarded contract), $165,700; Bowman Bros., $198,900; Edgemoor Bridge Co., $189,000; Pittsburg Bridge Co., $187,133; Groton Bridge Co., $175,000; J. Gianini Co., $174,000; King Bridge Co., $171,000.

TROY, N. C.—The Aberdeen & West End R. R., which has been extended to within six miles of this place, will require an iron bridge over the river near Troy before proceeding further. Pres., A. F. Page, Aberdeen, N. C.

SOUTH JACKSONVILLE, FLA.—The construction of a bridge over the St. Johns River is being agitated. Geo. B. Clark, of South Jacksonville, is interested.

AKRON, O.—Press reports state as follows: A company with a capital stock of $100,000 is being organized in this city to build a viaduct across the deep valley, which now separates the city from the heights of North Akron. The viaduct will extend from Main St., and will be 3,000 ft. in length.

BRYAN, O.—Bids are asked until Aug. 6 for building a steel bridge, 120 ft. long, with a roadway 16 ft. wide, over the St. Joseph River at Montpelier. J. F. Von Behren, Audr. Williams County.

CHAGRIN FALLS, O.—P. P. Evans, Asst. Engr. Osborn Co., Cleveland, is in charge of the substructure and grading of approaches for a bridge over the Chagrin River, near Chagrin Falls, consisting of four 33 ft. 9-in. spans, one 48-ft. span and one 180-ft. arch span, all plate girder work. The approaches are about 1½ miles in length.

CINCINNATI, O.—Bids are asked by the board of Hamilton county commissioners until Aug. 10 for constructing a wrought iron or steel bridge over Mill Creek, near Ivorydale. Frank S. Krug, Engr.

EAST LIVERPOOL, O.—The East Liverpool Bridge Co. was incorporated at Chester, W. Va., July 23 to build a bridge over the Ohio River from Chester, W. Va., to East Liverpool, O., as described in our issue of July 25; capital stock, $500,000, with $25,000 paid in; J. E. McDonald, J. G. Kerry and W. L. Smith, of East Liverpool, O.; E. D. Manhall, of Chester, W. Va., and Geo. P. Rust, of Cleveland, O.

ECORSE, MICH.—The township boards of Springwells and Ecorse have voted to construct a bridge over the River Rouge, on the River road, at an estimated cost of $25,000, work on which will begin in a short time. The township boards will pay $5,000 towards the construction, and the remaining $20,000 will be furnished by the Fort Wayne & Belle Isle Ry. Co. and the Wyandotte & Detroit River Ry. Co. Several bridge companies have submitted plans.

FREEPORT, ILL.—The committee of the supervisors and the town board are considering plans for erecting a new bridge over the Pecatonica River at Gund Ave., at an estimated cost of $6,000.

GALENA, ILL.—Bids are asked until Aug. 3 for building a 40-ft. span iron bridge over Small Pox Creek. W. S. McFadden, County Com.; James Morris, Com. Highways.

PEORIA, ILL.—Bids are asked until Aug. 5 for building an iron bridge on Reservoir Boulevard and one on the Mount Hawley Road, each to be 27 ft. in length and 32 ft. in width. C. C. Schnebly, William Dempsey, W. S. Hines, Highway Comrs.

APPLETON, WIS.—John Green is circulating a petition to be presented to the council Aug. 7 for a new highway bridge over the Fox River, near Mason St.

MARINETTE, WIS.—Press reports state that the cities of Marinette and Menominee have decided to build a $5,000 bridge across the Menominee River near the paper mills. This action was taken to insure the construction of a new $60,000 sulphite mill by the M. & M. Paper Co. Plans for it have been prepared and work will soon commence.

ST. PAUL, MINN.—New bids were asked until Aug. 1 for constructing the superstructure of the Como Ave. bridge. Matt Jensen, Cy. Clk.

DES MOINES, IA.—Local papers state that a plan is being considered by several property owners on both banks of the Des Moines River between the dam and the Sixth Ave. bridge, to have the city build a steel viaduct and bridge across the river at State St., or vicinity, to join the west and east sides, at an estimated cost of $50,000. It is proposed to have an incline from the bluffs on the west side. The bridge would be for the use of vehicles and pedestrians and perhaps for street cars.

HOT SPRINGS, ARK.—The question of building a bridge over the Ouachita River in Garland county at Wheeler's Ferry or at Gardener's Ferry, is being agitated.

THROCKMORTON, TEX.—It is reported that the new iron bridge across the Brazos River, which cost this county $16,600, was recently carried away by high water.

SYRACUSE, KAN.—Press reports state that the bridge across the Arkansas River at this place was washed away by a sudden rise in the river July 25. The two shore sections were carried down by the current, leaving the middle span intact.

LOS ANGELES, CAL.—Bids are asked until Aug. 7 for constructing a 50-ft. span bridge over a ravine near Calabassa; for a bridge 115 ft. long across a canyon about 25 miles north of Saugus; for several small bridges in the Elizabeth Lake road district, and for a two-span pile bridge 50 ft. long, and a 25-ft. pile bridge on the McNally and Northam road, near La Miranda station. T. E. Newlin, County Clk.

TORONTO, ONT.—Bids are asked until Aug. 6 for constructing two stone abutments for a bridge over the Etobicoke River between York and Reel counties. Engr., James McDougall, Court House, Adelaide St. East, Toronto.

WINNIPEG, MAN.—Bids are asked until Aug. 15 for building a steel superstructure for the Osborne St. bridge. J. C. Sproule, Chn. Com.

BUILDINGS.

PORTLAND, ME.—The committee has voted to advertise for bids for building the new armory. Arch., F. A. Tompson.

BOSTON, MASS.—Bids are asked until Aug. 3 for repairing the roof, cleaning and repainting walls of the post office and sub-treasury building. (Postponement from July 27.) Wm. M. Aiken, Supervising Arch., Washington, D. C.

LOWELL, MASS.—It is reported that the Hamilton Mfg. Co. will erect a storehouse at Jackson and Middlesex Sts. The building will be 125 x 240 ft., ten stories in height, built of red brick and granite, and have gravel roof, fire escapes, hose and reels, skylights, iron and steel columns, iron, bridge and steel truss work, steam freight elevator, electric lighting, automatic sprinklers, steam heating. The estimated cost is $125,000. C. M. Childs, Asst. Supt., Lowell; Chas B. Amory, Treas., 70 Kilby St., Boston.

NEW LONDON, CONN.—Bids are asked until Aug. 15 for erecting a U. S. public building, as stated in our advertising columns. Wm. Martin Aiken, Supervising Arch., Washington, D. C.

BROOKLYN, N. Y.—The lowest bid received by the navy department July 30 for rebuilding the construction and machine shop at the navy yard was that of Thomas Dwyer, of New York, at $38,700.

BROOKLYN, N. Y.—Bids are asked until Aug. 20 for erecting a museum building. Archs., McKim, Mead & White, 160 Fifth Ave., New York; Frank Squier, Comr. Dept. Parks, Litchfield Mansion, Prospect Park. ——Arrangements are being made by the board of supervisors of the Kings County Hospital for the erection of a new building, designed to accommodate 300 patients, estimated to cost $200,000 to $250,000. Arch., P. J. Lauritzen.

BUFFALO, N. Y.—Plans are asked until Aug. 30 for a 16-room school building at Delevan Ave. and Moselle St. R. G. Parsons, Secy. Dept. Pub. Wks.

BUFFALO, N. Y.—The following bids were received July 24 by the supervising architect at Washington, D. C., for the trench excavation and the concrete foundation for the new post office building: East Buffalo Marbleithic Paving Co., of Buffalo, $13,978, the work to be completed in 60 days (informal); Schmidt Bros., of Buffalo, $16,426, 45 days (withdrawn); Frank Baldwin, Washington, D. C., $25,119, 60 days; Grattan & Jennings, of Buffalo, $19,758, 60 days; Brown & Stabell, of Buffalo, $24,445, six weeks; Jonathan Clark & Sons Co., of Chicago, Ill., $26,500, 60 days; A. P. Kehr, of Buffalo, $23,788, two months; M. McNamara & Son, of Buffalo, $35,465, two months; German Rock Asphalt & Cement Co., of Buffalo, $23,288, 40 days; Henry Schaeffer's Sons, of Buffalo, $32,855, two months; Joseph J. Churchyard, of Buffalo, $24,349, two months; Logie & Leh, of Buffalo, $24,835, 35 days; L. L. Leach & Sons, of Chicago, Ill., $22,643, two months.

MOUNT MORRIS, N. Y.—Bids are asked by the board of managers of the Craig Colony for Epileptics until Aug. 5 for erecting, altering and improving the buildings of the colony at Sonyea, Livingston county. Arch., Geo. J. Metzger, 19 West Huron St., Buffalo; Mrs. Chas. F. Wadsworth, Chn. Com., Sonyea, N. Y.

NEW YORK, N. Y.—Bids are asked by the department of public parks until Aug. 14 for erecting the west wing of the American Museum of Natural History building in Manhattan Square.——Plans have been filed by the Third Ave. R. R. Co. for a one-story iron car shed on 10th Ave., between 129th and 130th Sts., to cost $20,000; by E. Kilpatrick, 50 West 67th St., for a seven-story brick apartment house at 94th St. and Central Park, West, to cost $100,000; by J. T. & W. S. Pyle, 436 Greenwich St., for a ten-story brick warehouse at 132 to 138 King St., to cost $175,000.——The Broadway Realty Co., the syndicate which is to erect the office building extending from Broadway to Greenwich St., and covering 5, 7, 9 and 11 Broadway, and 5 to 11, inclusive, in Greenwich St., has filed its plans with the building department. The building will be 162 ft. by 172 ft. by 201 ft., and will be 16 stories in height. The cost of the building is to be $1,800,000. Archs., W. & G. Ardsley.

POUGHKEEPSIE, N. Y.—It is reported that D. B. McCoy, Supt. New York Central, and E. C. Rand, Gen. Man. Poughkeepsie & Eastern R. R. Co., have been looking over the ground at the junction of the two roads, on Spruce St., with the view to the erection of a union passenger station by those companies. The proposed station will be 125 ft. in length, and will be handsomely equipped.

TONAWANDA, N. Y.—Bids are asked until Aug. 7 for erecting the new state armory building at Delaware Ave. and Benton St. Arch., I. G. Perry, Albany; Adj.-Gen., Edwin A. M'Alpin, Albany.

ATLANTIC CITY, N. J.—A syndicate is reported to have been organized with the object of building a mammoth hotel in Atlantic City. According to a statement of one of the members, it is composed of William M. Singerly, M. H. Goodin, of the Bingham House; Edward H. Flood and E. L. Robinson. The promoters say that they are now looking for a site of 15 or more acres upon which they propose to erect a building five stories in height that will cost not less than $1,500,000. Plans for the new hotel have been prepared by a Philadelphia architect. It is to be entirely of brick and is to contain 500 sleeping apartments.

CRANFORD, N. J.—It is reported that plans have been prepared for a new station for the Central R. R. of New Jersey at Union Ave., estimated to cost about $75,000.

NEWARK, N. J.—Bids are asked until Aug. 8 for the iron work and steel cells and for the heating and ventilating of the extension to the county jail. Arch., J. H. Lindsley, 762 Broad St.; C. W. Hellman, Chn. Com.

PITTSBURG, PA.—Bids are asked until Aug. 9 for erecting a building for the department of public safety at Sixth Ave. and Cherry Alley, estimated to cost about $200,000. Arch., Charles Bickel, 524 Penn Ave.; J. O. Brown, Dir. Pub. Safety.

PITTSBURG, PA.—Ernest Flagg, of New York, has prepared plans for the new St. Margaret's Memorial Hospital building at 46th and Davidson Sts., estimated to cost about $300,000. Pres., Reuben Miller; directors, James W. Brown, Henry S. Paul, Wilson Miller and John B. Jackson.——N. J. L. Peoples has been engaged to prepare plans for a new school building in Ward 21, to cost $35,000.

POTTSVILLE, PA.—It is reported that James Ellis and Andrew B. Cochran, of Pottsville, have been appointed to select a site for the Federal building in this place.

BALTIMORE, MD.—Bids are asked until Aug. 14 for erecting and also for heating a school building at Hanover and Lee Sts. J. T. Oster, Inspector of Bldgs.

ATLANTA, GA.—It is reported that bids will soon be asked by the Southern Ry. Co. for erecting the extension to the East Tennessee shops. The shops are to be placed next to the present machine shops and will be 210 x 100 ft. The smith shop is to be 80 x 180 ft. A transfer cable is also to be constructed. Ch. Engr., C. H. Hudson, of Washington, D. C.

AUGUSTA, GA.—The question of constructing a new union station in this city is being considered by the railway companies.

ABERDEEN, MISS.—Bids are asked until Aug. 5 for repairing the court house and post office building. (Postponement from July 25.) W. M. Aiken, Supervising Architect, Washington, D. C.

CLEVELAND, O.—Bids are asked by the supervising architect at Washington until Aug. 18 for painting and repairing the custom house at Cleveland. (Postponement from July 25.

ANNA, ILL.—The following contracts have been awarded for rebuilding the north wing and center building for the Illinois Southern hospital for the insane: Agnew & Co., masonry, concrete foundation, cut-stone work, galvanized-iron and tin work, carpenter work, painting and glazing, plumbing, electric wiring, and fireproofing, $94,054. The C. Carr, Jr., Co., hardware, $2,250. The Crane Elevator Co., elevator, $1,010. Kroeschelle Bros. Co., steam heating and ventilating, $12,532. Aug. Zander Co., plastering, $16,970. The Chicago Architectural Iron Co., ironwork, $20,950. All of Chicago.

CHICAGO, ILL.—A building permit has been granted to the Studebaker Bros. Mfg. Co. for a 10-story brick warehouse and office building at 378 to 388 Wabash Ave., to cost $225,000; the North Chicago City Ry. Co. for a one-story brick power house at 127 to 139 Hawthorne Ave., to cost $100,000.

KANSAS CITY, MO.—Bids are asked until Aug. 20 for constructing the superstructure of the public library building at Ninth and Locust Sts. Archs., W. F. Hackney and Adriance Van Brunt, 34 Beals Bldg.; W. E. Benson, Secy. Bd. Education.

TORONTO, ONT.—Bids are asked until Aug. 12 for erecting an office building, known as the Foresters' Temple, at Bay and Richmond Sts. Arch., Geo. W. Gouinlock, 53 King St., East.

WATER-WORKS.

YORK, ME.—Harry Jose, of Saco, is reported as making surveys for works for the York Water-Works Co. It is stated that the supply will be from Chase's Pond, and that the works will supply York Harbor, Long Beach and York Beach.

BARTLETT, N. H.—The Glen Water Co. is reported to have been incorporated, with a capital stock of $900.

LYNN, MASS.—The city has sold $165,000 of water bonds to E. H. Rollins & Sons, of Boston, at 7.3% premium. Of this amount $125,000 is for a new basin in the Hawkes Brook Valley and $40,000 for an additional water supply on the highlands.

NEW BEDFORD, MASS.—The contract for a new distributing reservoir has been formally awarded to W. J. Latham & Co., the firm consisting of W. J. Latham, of Northampton; Daniel O'Connell, of Holyoke, and the Roxbury Granite Co., of Keene, N. H. This work was advertised in the Engineering News, and the itemized bids published July 4.

PITTSFIELD, MASS.—Prof. Greene, of Troy, is investigating the question of an additional water supply for this place.

SALEM, MASS.—The council has appropriated $12,000 for a new main in Essex St.

SPENCER, MASS.—The question of an additional water supply is being agitated.

SPRINGFIELD, MASS.—The fire commissioners have reported locations for 25 new hydrants, in response to an invitation of the water commissioners.

BRIDGEPORT, CONN.—The Stillman Spring Water Co. has been organized at this place with a capital stock of $12,500, commencing with $2,500; incorporators, A. W. Stillman, of Bridgeport; F. M. Stillman, of Rahway, N. J., and Helen B. Stillman.

AKRON, N. Y.—There is talk of constructing works at this place.

ANGELICA, N. Y.—Press reports state that a franchise has been granted to a local company, and that works will be constructed at an early date.

BROOKLYN, N. Y.—Bids are asked until Aug. 5 for a supply of 20 to 8-in. cast iron pipe and 228,480 lbs. of special castings, as stated in our advertising columns. (Postponement of date from Aug. 3.) Alfred T. White, Comr. Cy. Wks.

BUFFALO, N. Y.—Bids are asked by the department of public works until Aug. 7 for 700 hydrant covers and 100 extension cases, and for excavating trench in Kensington Ave.; and until Aug. 12 for four new boilers for the 30,000,000-gallon pumping engine to be erected at the lower pumping station.

FORT PLAIN, N. Y.—Work has ceased on the new water-works, and it is reported probable that the contract will be declared forfeited and the construction resumed by the commissioners.

HEMPSTEAD, N. Y.—The village trustees are reported to have ceased negotiations with the water company and to have voted to engage L. Russell Clapp to prepare plans and specifications for new works.

NIAGARA FALLS, N. Y.—The board of public works has recommended the construction of a large number of new water mains.

OWEGO, N. Y.—Surveys have been made by Geo. B. Mussy, and G. Y. Robertson, Supt. Owego Water-Works Co., for a new 63,000,000-gallon reservoir.

ROCHESTER, N. Y.—The lowest bids for laying water mains were those of Whitmore, Rauber & Vicinus, at $1,500, $1,575, $1,572 and $945, respectively, for the four contracts; pipe to be furnished by city.

SOLVAY, N. Y.—A water-works system, estimated to cost about $40,000, is being constructed at this place, two-thirds of the cost being borne by the Solvay Process Co., according to press reports.—An election will be held Aug. 7 to vote on an issue of $75,000 in bonds for works. Wm. B. Boyd, Chn. Trustees.

STAPLETON, N. Y.—Bids are asked until Aug. 1 for a water supply at the county farm, the work including a 6-in. well, pump, reservoir, etc. Franklin C. Vitt, Clk.

WALTON, N. Y.—The Eastbrook Water Co., of Walton, Delaware county, was incorporated July 24; capital stock, $30,000; directors, G. T. Warner, Alexander Neish, J. H. Townsend, and Charles Herring.

WARSAW, N. Y.—The contract for building reservoir and laying pipe for the new works has been awarded to Chandley Bros. & Co., of Beaver Falls, Pa.; contract for pipe to F. B. Hawkins & Co., of New York, and that for hydrants, valves and boxes to the Detrick Supply Co., of St. Louis.

FRANKLIN, N. J.—A special election will be held in Franklin township Aug. 21 to vote on the question of purchasing the plant of the Nutley Water Co.

HOBOKEN, N. J.—Bids are asked until Aug. 20 for furnishing and delivering 55 gross tons of 6-in. cast iron water pipe. Henry Lohmann, Jr., Water Registrar.

JERSEY CITY, N. J.—Bids are asked until Aug. 6 for furnishing and delivering 3,600 lengths of 20 to 4-in. cast iron water pipe; also for laying 20 to 4-in. water pipe. Address Geo. W. Harding, Chn. Com.

EPHRATA, PA.—The council has offered the water company $20,000 for its plant, and it is reported that unless this offer is accepted within ten days municipal works will be constructed. The water company offers to sell its plant for $40,000.

HOMESTEAD, PA.—At a special election July 23 the citizens voted to issue $40,000 in bonds, including $10,000 for water-works extensions.

HONEY BROOK, PA.—It is reported that Lancaster capitalists are talking of building works at this place.

PHILADELPHIA, PA.—H. Bayard Hodge, Walnut Lane, Germantown, Pa., is treasurer, and Francis M. Burke, H. S. Chambers, Howard Watkin and Joseph F. Keen, Jr., of Philadelphia, and Joseph W. Hawley, of Media, Pa., are directors of the following five water companies, each incorporated July 24 with a capital stock of $1,000: Villa Nova Water Co., to operate in Radnor township, Delaware county; Willistown Water Co., Willistown township, Chester county; Tredyffrin Water Co., Tredyffrin township, Chester county; East Whiteland Water Co., East Whiteland township, Chester county; Berwyn Water Co., East Town township, Chester county.

PITTSBURG, PA.—Press reports state that E. M. Bigelow, Dir. Pub. Wks., will advertise for bids this week for two new pumps for the Brilliant pumping station.

SHENANDOAH, PA.—The contract for making water connections has been awarded to Gallagher & Lamb at $4,740.

HAGERSTOWN, MD.—The Monterey Water Co. has been organized by John Curlett, German H. Hunt, David S. Bartlett and others to furnish water to Monterey and other resorts in the Blue Ridge mountains.

LONACONING, MD.—The Lonaconing Water Co. has been incorporated by Malcolm Sinclair, Jacob Schinneller, J. J. Bell and others, and the construction of works has been commenced.

BRISTOL, VA.—The council is reported to have voted to build a new reservoir at a cost of about $1,000.

BENWOOD, W. VA.—The council is reported to have accepted the proposition of the Benwood Water-Works Co., and it is stated that mains will be laid at once, the water supply to be from Wheeling.

SALEM, W. VA.—The contract for works has been awarded to Hallock Bros., of Wheeling, at $4,500.

FLORENCE, S. C.—Bids were asked until July 31 for constructing works at this place, the city to furnish an artesian well for a supply. F. H. McLeod, Chn. Com.

HOPKINSVILLE, KY.—The council has contracted with Samuel R. Bullock, of New York, for the construction of works, the city to pay $4,000 a year for 100 fire hydrants. The plant will include a stand-pipe and 9½ miles of 12 to 6-in. mains and the construction is to be begun at once.

BLOOMVILLE, O.—The citizens are reported as agitating the question of works.

CLEVELAND, O.—The Variety Iron Works Co. is reported to have been the lowest bidder for four new boilers for the pumping station, at $3,240.

CLEVELAND, O.—It is reported probable that the villages of East Cleveland, Collinwood and Glenville will combine and build works.

ELYRIA, O.—The council has decided by an almost unanimous vote to call a special election for the citizens to vote on a proposition to issue $100,000 in bonds for the purchase of the works. The water company has offered to sell its plant for $75,000, and it is proposed to spend $25,000 for improvements.

IRONTON, O.—The water-works building was burned July 24, causing a loss of several thousand dollars.

LEBANON, O.—Bids are asked until Aug. 15 for constructing works, as described in our advertising columns. Engr., John W. Hill, Cincinnati; R. B. Corwin, Cy. Clk.

MILLERSBURG, O.—Press reports state that the trouble over the projected works has been adjusted and that specifications will be completed about Aug. 15, and bids asked at once for the construction. The plans will be prepared by Burton J. Ashley, 720 Chicago Opera House, Chicago.

MONTPELIER, O.—Bids are asked until Aug. 15 for constructing works, as stated in our advertising columns. Engrs., Voorhees & Witmer, Buffalo, N. Y.; W. S. Boon, Pres. Trustees.

WARREN, O.—The council has decided to pay the water company $10,000 of the amount due it on condition that a filter plant is purchased at once, the remainder of the amount due the company to be paid 30 days after the filter plant has been successfully tested.

WEST CARROLLTON, O.—It is reported that plans and specifications for works are being prepared by R. T. Sebold, of Dayton, O.—Bids are asked until Aug. 16 for the purchase of $3,000 of 6% water bonds. C. H. Baker, Clk.; Geo. W. Deemer, Mayor.

ELWOOD, IND.—The Elwood Water Co. is reported about to sink several artesian wells.—The American Tin Plate Co. is constructing a reservoir and will put in works to supply its plant.

FOWLER, IND.—The Seckner Contracting Co., Unity Bldg., Chicago, has been awarded the contract for putting in a complete system of works, at $34,985.

GARRETT, IND.—Bids are asked until Aug. 16 for the purchase of $19,500 of water bonds, as stated in our advertising columns. W. J. Martin, Cy. Clk.

MONTICELLO, IND.—Web. P. Bushnell, Engr., writes us that the contract for works, as advertised in Engineering News, has been awarded to Mansfield & Allen, of Indianapolis, at $28,800, the other bids being the Howe Pump & Engine Co., Indianapolis, $32,342; Geo. C. Morgan, Chicago, $33,630, and the Seckner Contracting Co., of Chicago, $34,757. Stephens & Bedwards, Logansport, Ind., bid $26,800 on a cash basis, which was not according to the advertisement.

ALLEGAN, MICH.—The proposition to issue $8,000 in bonds for a steam pump was defeated at the election July 24.

FLUSHING, MICH.—Specifications for water-works and an electric light plant have been completed, and it is stated that the contracts will be awarded about Aug. 20.

JACKSON, MICH.—An election will be held Aug. 19 to vote on an issue of $7,500 in bonds for increasing the water supply, $10,000 for engine house and equipment, $17,500 for extension of mains and $600 for expenses of election.

METAMORA, MICH.—It is reported that an election was held July 31 to vote on an issue of $2,000 in bonds for the construction of water-works.

PORT HURON, MICH.—Bids are asked until Aug. 5 for furnishing and delivering 100 tons of 6 and 4-in. cast iron water pipe; Hugh F. Doran, Supt.

ROCKFORD, MICH.—A special election will be held Aug. 19 to vote on an issue of bonds for works.

CAMPUS, ILL.—It is reported that bids were recently received for constructing works at this place.

EFFINGHAM, ILL.—A local paper states that 1,380 tons of pipe has been purchased, and that the contract for constructing works will be awarded this week. R. E. Brownell, Pres. Brownell Improvement Co., Chicago, is interested. Engr., T. A. Hardman, Olney, Ill.

FREEBURG, ILL.—The village trustees are reported to have adopted plans for works, which will be constructed at once.

CASSVILLE, WIS.—At a special election July 19 the citizens voted to issue $4,500 in bonds for works.

DEERFIELD, WIS.—The contract for constructing works has been awarded to the U. S. Wind Engine & Pump Co., of Batavia, Ill.

TOMAHAWK, WIS.—The contract for extensions has been awarded to J. C. Burns & Co., of Wausau, at $1,344, the other bids being F. S. Garland, of Tomahawk, $1,294; James H. Fife, of Oshkosh, $1,387; E. J. Sykes, of Minneapolis, $1,493.

WATERTOWN, WIS.—Theodore Prentiss, Jesse Stone and others have been appointed a committee to see if a local company can be organized to construct works, at an estimated cost of about $100,000. It is probable that an engineer will be engaged to prepare plans in the near future.

INDIANOLA, IA.—It is reported that the city will buy the ground for a pumping station and stand-pipe and pay a contractor $40,000 for constructing works, $10,000 in cash and $30,000 in bonds; should the city default in the payment of the bonds or interest the contractor will take the works and the city pay $6,400 a year for fire protection.

OWATONNA, MINN.—Bids are asked until Aug. 15 for a 1,000,000-gallon pumping engine. S. S. Greene, Chn. Com.

JONESBORO, ARK.—The Jonesboro Water-works Co. has been incorporated with a capital stock of $20,000 by Jesse W. Starr, of St. Louis, and J. L. Pace and E. L. Westbrook, of Jonesboro.

HEARNE, TEX.—C. H. Caffield, of Rockdale, is reported to have been in the city recently investigating the question of constructing works.

GRAND JUNCTION, COLO.—Bids are asked until Sept. 10 for constructing works, as stated in our advertising columns. This is a postponement of date from Aug. 20. Engr., C. P. Allen, Denver; F. W. Cobb, Cy. Clk.

ST. LOUIS, MO.—The mayor has approved ordinances authorizing the purchase of high service pumping engines Nos. 9 and 10.

KERN, CAL.—The Kern City Land & Water Co. was incorporated July 22 with a capital stock of $50,000, all paid in. John Kaar, H. F. Williams, J. N. Thompson and others are interested.

LOS ANGELES, CAL.—The Tapo Water Co. was incorporated July 22; capital stock, $250,000, commencing with $50,000; incorporators, J. J. Linergan, D. C. Morrison, W. H. Shinn, William T. Smith and others.

PRESCOTT, ARIZ.—Press reports state that owing to a scarcity of water several citizens have agreed to advance $1,000 for sinking the well on Goose Flat another 100 ft., and that public sentiment is strongly in favor of municipal ownership of the works.

IRRIGATION.

WALWORTH, NEB.—Bids are asked until Aug. 15 for the purchase of $32,000 of 6% irrigation bonds. P. L. Metcalf, Secy. Lillian Irrigation District of Custer County.

SAN JOSE, CAL.—It is reported that Chas. N. Felton, Francis Smith, D. M. Burns, and J. Givens, of San Francisco, and Col. J. H. Morehead, of San Jose, are making arrangements for extending the construction of wells, etc., near the Twelve-Mile House, on the Monterey road, for irrigating purposes. The proposed work includes the building of a tunnel at a cost of about $75,000, to carry water from a lagoon of 500 acres, owned by Fiacro Fisher. Engr., W. Wheeler.

SALT LAKE CITY, UTAH.—The Mount Nebo Irrigation Co. is reported as soon to award the contract for constructing a pipe line, with flumes and rock work, through the canyon of Current Creek.

NEW COMPANIES.—White River Irrigation Co., Crawford, Neb.; $200,000; Leroy Hall, R. G. Smith, Lewis N. Freeman.

Tapo Water Co., Los Angeles, Cal.; $250,000, with $50,000 paid in; J. J. Lonergan, D. C. Morrison, W. H. Shinn, Mrs. S. S. Lightfoot, Wm. T. Smith, of Los Angeles.

Kern City Land & Water Co., Kern, Cal.; $50,000, with full amount paid in; to construct canals, ditches, flumes, etc., for irrigation purposes; John Kaar, H. F. Williams, J. N. Thompson, S. N. Scott, E. Thompson, of Kern.

SEWERAGE.

SACO, ME.—The question of constructing a new 16 to 20-in. pipe sewer in Pleasant St. is being considered.

BOSTON, MASS.—Bids are asked until Aug. 3 for constructing 2,160 ft. of 12 to 6-in. pipe sewers, Section 1 of the Huntington Ave. sewer. B. T. Wheeler, Supt. Sts.

DALTON, MASS.—Plans are being considered for constructing sewers to drain the portion of the city between Center Pond and Deming St.

NEWTON, MASS.—The board of public works has recommended the extension of the system to Newton Highlands and the Charlesbank Road sewer to connect with the present system.

MERIDEN, CONN.—It is reported that the contract for grading for the new sewage beds in Yaleville has been awarded to W. S. Clark, and for furnishing the material to the H. Wales Lines Co. It is understood that Mr. Clark's bid was about 18.4 cts. per cu. yd., the Lines Co's., 19½ cts.; H. J. Moss's, of Cheshire, 19½ cts., and S. F. Keenan's, 22½ cts. For the material the bids were supposed to be about as follows: Brick, Lines Co., $8.50 per M., and G. L. Goodrich, $8.75. Rosedale cement, Lines Co., $1.10 per bbl.; Goodrich, $1.09. The average figures of the Lines Co. on furnishing pipe are understood to be 59.8 cts.; Goodrich's, 66.3 cts. There are about 25,000 cu. yds. of earth to be removed.

NEW HAVEN, CONN.—The committee has voted to recommend the construction of sewers in three streets, and is considering the construction of a sewer in Greenwich Ave.

ROCKVILLE, CONN.—The committee, which consists of E. L. Heath, A. P. Hammond, E. G. Butler, H. L. Allen and A. J. Cavanaugh, is making arrangements preparatory to asking for bids for constructing a system, the work to be begun probably by Sept. 1. It is reported that the city will purchase the materials. Engr., Samuel M. Gray, Providence.

AVON, N. Y.—It is reported that the commissioners will soon advertise for bids for constructing a system, estimated to cost $12,000, surveys for which are being made.

BATAVIA, N. Y.—The question of constructing a system is again being considered. Plans were prepared some time ago by Joseph W. Holmes. The committee is composed of D. W. Tomlinson, J. H. Bradish, John Day and Andrew Skelley.

BINGHAMTON, N. Y.—The council has voted to construct over 4,000 ft. of 27 × 18-in. brick and 20 to 8-in. pipe sewers in three streets, at an estimated cost of about $7,500. Lewis Seymour, Cy. Clk.

DUNKIRK, N. Y.—The council has voted to construct certain sewers.

ITHACA, N. Y.—The following bids were received July 27 for constructing the sewage pumping station; Ch. Engr., Henry N. Ogden; Roger B. Williams, Chn.:

Thomas F. Moore, Buffalo, N. Y.	$29,663
Lauer & Hagerman, Rochester, N. Y.	27,403
R. H. Bethel & Co., N. Y. (awarded contract)	25,194
Driscoll Bros. & Reid, Ithaca, N. Y.	27,013
Burns & Banks, Niagara Falls, N. Y.	27,491

JAMAICA, N. Y.—The commission has authorized J. J. McLaughlin to prepare plans to be submitted Sept. 3 for a system, estimated to cost about $200,000.

MOUNT MORRIS, N. Y.—Bids are asked by the Craig Colony for Epileptics until Aug. 5 for constructing a system of pipe sewers, sewage beds, etc., for the colony at Sonyea. Mrs. Chas. F. Wadsworth, Chn. Executive Com., Sonyea, Livingston county, N. Y.

MOUNT VERNON, N. Y.—Bids are asked until Aug. 6 for constructing lateral sewers in Elm and Monroe Sts., and until Aug. 20 for a lateral sewer in North St. E. G. Pease, Cy. Engr.; Walter C. Reid, Chn. Com.

TROY, N. Y.—Bids are asked until Aug. 6 for constructing 18-in. pipe sewers in Myrtle and Spring Aves. E. O. Ross, Secy. Bd. Contract.

PATERSON, N. J.—The board of aldermen proposes to construct about 2,000 ft. of 18 and 12-in. pipe sewers. Thomas McLean, Cy. St. Comr.

CHESTER, PA.—The council is considering ordinances for constructing 24-in. brick and 18-in. pipe sewers. Charles Ladomus, Cy. Engr.

NARBERTH, PA.—The council has granted Goodman & Clothier, of Philadelphia, permission to construct a main sewer in Windsor Ave. to drain their property, which covers about 67 acres. The sewer is to carry off both storm and house drainage, and is to discharge into a vault 30 ft. in diameter and 12 ft. in depth, from which the liquid is to be syphoned into a smaller vault and then let onto a filter bed. A. P. Redifer, Town Clk.

PHILADELPHIA, PA.—Bids are asked until Aug. 6 for constructing main and branch sewers, and for reconstructing sewers and inlets, etc. Thos. M. Thompson, Dir. Pub. Wks.

PITTSBURG, PA.—The board of public works received the following bids July 27 for constructing the Four-Mile Run sewer: Keeling, Ridge & Co., $188,015; Sloan, McIlvain & Ott Bros., $182,821; W. J. Dunn, $190,500; Thomas McNally, $186,963; Sheets & Hammond, $192,928; Gwinner & Jones, $222,607; Jute & Filey, $275,725; Bowman & Bros., $262,133; Benny & Co., Pittsburg (awarded contract), $147,602; James H. McQuade, $197,237. This is the last section of the East End drainage system and was noted in our issue of July 25. E. M. Bigelow, Dir. Pub. Wks.

SAVANNAH, GA.—The construction of a system is being discussed. Percy Sugden is interested.

ALLIANCE, O.—At an election held July 20 it was voted to issue $20,000 or $30,000 in bonds for a sewage disposal plant.

CHILLICOTHE, O.—The question of constructing a system estimated to cost from $75,000 to $100,000 is still being considered.

CLEVELAND, O.—Plans have been prepared for constructing sewers in four streets. S. G. McClure, Secy. Bd. Control.

YOUNGSTOWN, O.—The board of health is considering the question of constructing new sewers.

INDIANAPOLIS, IND.—Bids are asked until Aug. 8 for constructing 640 ft. of 12 and 6-in. pipe sewers in Alabama St. C. C. Brown, Cy. Engr.——We are informed that resolutions have been adopted for constructing 2,570 ft. of a 54 to 38-in. brick and 30 to 20-in. pipe sewer in Indiana Ave., the contract to be awarded about Aug. 20.

ADRIAN, MICH.—Andrew Rosewater, of Omaha, Neb., has made preliminary investigations in regard to a system. James Blair, Cy. Surv.

PONTIAC, MICH.—The committee has made a report on a proposed system, estimated to cost $25,000, bonds for which will soon be issued.

GRAND RAPIDS, MICH.—The chairman of the committee has been directed to prepare an ordinance for constructing sewers in eight streets.——The committee is considering the question of building a 15-ft. channel in the center of the river at an estimated cost of $9,741, to carry off the sewage.

IOWA CITY, IA.—The city will soon ask for bids for constructing about 1,000 ft. of 8-in. pipe sewers. Chas. S. Magowan, Cy. Engr.

ONTARIO, CAL.—A. S. Bent, of Los Angeles, has been awarded the contract for constructing a system at $6,850.

NAPIER, ONT.—Bids are asked for constructing a drain in Brooke, at an estimated cost of $12,000. Archibald McIntyre, Reeve; W. G. Willoughby, Clk.

VICTORIA, B. C.—The council has voted to appropriate $20,000 for sewers, the construction to be done by day labor, according to reports.

GARBAGE DISPOSAL.

BRADDOCK, PA.—Charles Flinn, who has the contract for garbage disposal at Pittsburg, has made an offer to the council for collecting and disposing of the garbage of this place. It is stated that Mr. Flinn's new plant will have a capacity of 100 tons of garbage a day, and that he is only collecting about 75 tons in Pittsburg. It is thought that this borough will either contract with him or build a furnace of its own.

YOUNGSTOWN, O.—The board of health is considering the question of garbage disposal.

INDIANAPOLIS, IND.—Bids were asked by the board of public works until July 30 for the collection and disposition of garbage, night soil and dead animals. It was thought that the American Reduction Co., with which the city has been negotiating, would probably be the only bidder. This company asked $20,000 a year for ten years.

STREETS AND ROADS.

HARTFORD, CONN.—The street committee has recommended the paving of Main St. with sheet asphalt and State St. with asphalt blocks.

ALBANY, N. Y.—Bids are asked until Aug. 5 for paving four streets with brick and two with granite blocks. T. J. Lanahan, Clk. St. Dept.

BROOKLYN, N. Y.—Bids are asked until Aug. 6 for paving Mill St. with cobblestones. A. T. White, Comr. Cy. Wks.——Frank Squier, Comr. Parks, has filed a map with the department of city works showing the proposed extension of the Eastern Parkway to connect with the Highland Boulevard, leading to Highland Park. Walter Meserole, Cy. Surv.

BUFFALO, N. Y.—Bids are asked until Aug. 7 for paving and repaving portions of six streets. R. G. Parsons, Secy. Dept. Pub. Wks.

NORTH TONAWANDA, N. Y.—Bids are asked until Aug. 13 for paving Payne's Ave., as stated in our advertising columns. Engr., T. W. Barrally, Smith Bldg.; T. E. Warner, Village Clk.

ROCHESTER, N. Y.—The council proposes to pave Maple St. with asphalt at an estimated cost of $42,500. T. S. Pulver, Cy. Clk.

ROCHESTER, N. Y.—Bids are asked until Aug. 2 for constructing a sewer in Mortimer St., and for paving a portion of the street with asphalt, and until Aug. 9 for cement sidewalks in two streets. T. J. Neville, Clk.

CAMDEN, N. J.—Bids are asked until Aug. 2 for paving two streets with Belgian blocks and two with macadam, and for constructing sewers in several streets; and until Aug. 12 for paving Federal St. Chas. P. Sayres, Chn. Com.; L. E. Farnham, Cy. Engr.

MORRISTOWN, N. J.—We are informed that 116 bids were received July 16 for macadamizing over 50 miles of roads in Morris county, as advertised in Engineering News, the following contracts being awarded: J. C. White, County Clk., Morristown; Wm. E. King, Engr., Landing, N. J.; Osborne & Marcellus, Montclair, N. J., $18,114, $17,028, $6,732; Drinkwater & Drake, Chester, N. J., $8,543; Pierce & Miller Engineering Co., 34 Cortlandt St., N. Y., $15,430, $10,895, $13,249, $12,238, $12,456; C. H. Green & Co., Morristown, N. J., $23,261; Cook & Cisco, Butler, N. J., $7,714; Colfax & Steele, Pompton, N. J., $4,264; Dickerson-Suckasunny Mining Co., Weldon, N. J., $7,667; McKeran, Bergen & Co., Paterson, N. J., $1,779, $14,072; Fox & Neff, Rockaway, N. J., $15,163; J. B. Salmon, Ledgewood, N. J., $19,576; Richards & Allen, $4,914.

NEWARK, N. J.—The following contracts have been awarded for paving Lincoln Park and Clinton Ave., from Broad St. to city line: Asphalt, Barber Asphalt Paving Co., $79,110; granite, Thos. J. Regan, $18,833; Littleton Ave., the New Jersey Asphalt Co., $46,900; McWhorter St., granite, David Harper, $14,689; Mulberry St., granite on concrete base, Terence McManus, $27,032; Academy St., trap rock, John F. Shanley, $14,805.

DUBOIS, PA.—Bids are asked until Aug. 6 for furnishing sand for filling for paving North Brady St. D. J. Carson, Chn. Com.

HOMESTEAD, PA.—At an election held July 23 it was voted to issue $20,000 in bonds for street improvements, $10,000 for sewers and $10,000 for water extensions.

TURTLE CREEK, PA.—The citizens have voted to issue $50,000 in bonds for paving.

WILKES BARRE, PA.—Bids are asked until Aug. 3 for repaving Northampton St. with asphalt. Frank Deitrick, Cy. Clk.; I. M. Kirkendall, Chn. Com.

WILMERDING, PA.—Bids are asked until Aug. 5 for 2,900 cu. yds. of grading in Welsh Ave. C. C. Cowell, Borough Clk.

LOUISVILLE, KY.—Bids are asked until Aug. 9 for paving portions of 10 streets with brick and four with granite blocks. J. H. Hoertz, Secy. Bd. Pub. Wks.

CINCINNATI, O.—Bids are asked by the board of administration until Aug. 8 for paving Spring Grove Ave. with brick.

COLUMBUS, O.—Bids are asked until Aug. 13 for grading and paving Parsons Ave. James A. Fanning, Clk. Bd. Pub. Wks.

SPRINGFIELD, O.—Bids are asked until Aug. 20 for the purchase of $6,159 of 6% paving bonds. S. J. Wilkerson, Cy. Clk.

WARREN, O.—Bids are asked until Aug. 19 for 22,000 sq. yds. of brick paving. Homer C. White, Cy. Engr.; Albert E. Andrews, Cy. Clk.

INDIANAPOLIS, IND.—Bids are asked until Aug. 8 for 3,915 sq. yds. of asphalt paving. C. C. Brown, Cy. Engr.——Resolutions have been passed for 10,000 lin. ft. of brick sidewalks and about 7,000 lin. ft. of cement sidewalks, the contracts to be awarded about Sept. 1.

KOKOMO, IND.—Gantz & Sullivan, of Columbus, O., are reported to have been awarded the contract for the construction of a mile of brick streets in this city, and they will begin work at once. The streets are 60 ft. in width, with 12-ft. cement sidewalks. Veedersburg Poston block will be used in paving. The contract price is $9.80 per lin. ft.

MICHIGAN CITY, IND.—Bids are asked until Aug. 12 for paving William St. with brick. A. H. Leist, Cy. Clk.

BELLEVILLE, ILL.—Bids are asked until Aug. 5 for paving 1,138 lin. ft. of West Main St. with brick. F. W. Puderer, Cy. Clk.

EAST ST. LOUIS, ILL.—The following bids were received July 20 for paving Summit Ave. with brick: Casper Stolle, $17,624; Hill & O'Meara, $14,655; Patrick Lyons, $15,290; A. J. Heman, $12,944; Veiths, Krainka & Stiefel, $14,136; R. Coleman, $15,695; Hill & McCabe, $14,208; A. Rucking & Co., $18,813.

PEORIA, ILL.—Bids are asked until Aug. 15 for 29,057 sq. yds. of asphalt paving in Jefferson Ave., and 1,197 sq. yds. in Crescent Ave., as stated in our advertising columns. A. D. Thompson, Cy. Engr.; Will O. Clark, Comr. Pub. Wks.

MILWAUKEE, WIS.—Bids are asked until Aug. 6 for the purchase of $100,000 of 5% street improvement bonds and $100,000 of city hall bonds. Wm. J. Fiebrantz, Comptroller.

MILWAUKEE, WIS.—The board of public works asked for bids until Aug. 1 for paving Grand Ave. with asphalt, and bids will soon be asked for paving the remainder of the street, from 21st St. to 27th St., and for paving Michigan St. and Broadway with asphalt. G. H. Benzenberg, Cy. Engr.

DES MOINES, IA.—Bids are asked until Aug. 3 for 9,600 sq. yds. of brick paving and 4,760 lin. ft. of cement curbing in 19th St. Edward Wright, John Sherman, Bd. Pub. Wks.

IOWA CITY, IA.—Bids will soon be asked for about 24,000 sq. yds. of brick paving, single course, on macadam foundation. Preparatory to doing this work a 25,000-lb. steam roller has been purchased of the O. S. Kelley Co. Chas. S. Magowan, Cy. Engr.

ST. PAUL, MINN.—The board of public works has recommended the paving of Wabasha St. with cedar blocks, at an estimated cost of $27,870, $15,270 of which will be paid by the city and the remainder by the street railway company.

FARGO, N. DAK.—It is reported that the following contracts have been awarded for about two miles of paving: Front St., 20,085 sq. yds., McDonald & O'Neil, of Fargo, at $21,282; Broadway, 16,443 sq. yds., McDonald & O'Neil, of Fargo, $16,088; Northern Pacific Ave., 15,522 sq. yds., J. E. Schneider, at $15,839.

ST. LOUIS, MO.—Bids are asked by the board of public improvements until Aug. 11 for repairing the asphalt pavements in three streets.——The board has rejected the bids for paving Washington Boulevard with asphalt, and has voted to readvertise. The following were the bids received: P. S. Marquis, $12.50 per sq. of 100 ft.; Mr. Murdock, of New York, $12.65; Barber Asphalt Paving Co., $29; National Asphalt Co., $19.25; Hill & O'Meara and Fruin-Bambrick Co.

SALMON CITY, IDAHO.—It is reported that surveys have been made for a wagon road between Shoup and Mineral Point, a distance of 15 to 18 miles. L. L. Colbath and the Kentuck Co. are interested.

SEATTLE, WASH.—Plans are being prepared for paving Front and Second Sts. with brick, for which bids will soon be asked.

OAKLAND, CAL.—The county supervisors, members of the Good Roads Association, and the citizens, with Marsden Manson and R. C. Irvine, of the State Bureau of Highways, have been discussing the question of improving the roads of Alameda county.

MANUFACTURING PLANTS.

FAIR HAVEN, VT.—The Evergreen Slate Mills, three miles east of this place, which were recently destroyed by fire, will probably be rebuilt at once.

LOWELL, MASS.—A seven-story addition is to be built to the Appleton Mfg. Co's. plant on Jackson St., according to reports.——An addition is to be built to Mill No. 6, owned by the Tremont & Suffolk Co. The structure will be five stories in height and provided with the latest improvements.

QUINCY, MASS.—A new tack factory is to be built here for B. Woodsum & Co., according to press reports.

NEW BEDFORD, MASS.—The erection of a new mill is said to be contemplated by the Howland Mill Co.

PROVIDENCE, R. I.—George P. Warfield, of Woonsocket, is reported to have been awarded the building contract for an addition to the Manville mill.

WOONSOCKET, R. I.—It is stated that an addition is to be built by the Leicester Knitting Co. to its plant on Vernon St.

BRISTOL, CONN.—A large plant is to be erected here for the Horton Mfg. Co., which will be used as a manufactory for steel fishing rods, according to reports.

GREENWICH, CONN.—The Rippowan Mfg. Co. is said to be contemplating the establishment of a plant for the manufacture of plush goods on the Miamus River at Dumpling Pond.

HARTFORD, CONN.—A site has been purchased south of Albany Ave. by W. H. Bliss & Sons, on which a large wood-working factory will be erected. Plans have been prepared, and work will be commenced in the near future, according to reports.

ANTWERP, N. Y.—A grist mill is to be erected at this place in the near future, and bids for the construction are now being received, according to reports. Address J. W. Griffin, No. 4 Washington Hall Block, Watertown, N. Y., for information.

GLOVERSVILLE, N. Y.—The Louis Knoff Mill at this place, which was destroyed by fire, is to be rebuilt and equipped with the latest improvements.

ITHACA, N. Y.—It is reported that Wm. A. Ingram is contemplating the location of a linen factory at this place.

JAMESTOWN, N. Y.—The erection of a two-story ironclad factory at Falconer is said to be contemplated by Holmes & Paterson, of this city. They will manufacture wood carving machinery.

LOCKPORT, N. Y.—It is reported that a new brewery is to be built on the bank of Oak Orchard Creek at this place.

ROME, N. Y.—Work has been commenced on the Rome Brass & Copper Co's. plant at this place. The structure will be one story in height and provided with modern machinery.

SING SING, N. Y.—Press reports state that a new iron foundry is to be erected at this place.

TROY, N. Y.—Extensive improvements are to be made to the Quandt Brewery Co's. plant, 847 Rover St., at a cost of $40,000. A new storage house and new machinery will be among the improvements.

UNIONVILLE, N. Y.—It is reported that E. L. Brown will rebuild his silk mill at this place.

VALATIE, N. Y.—It is reported that a new knitting mill is to be erected on the site of the old Canoe cotton mill.

WATERFORD, N. Y.—It is stated that the Ford Mfg. Co's. knitting mill, which was recently burned, is to be rebuilt at once.

BRIDGETON, N. J.—It is reported that the foundry and shop of the Cumberland Nail & Iron Co., which was recently destroyed by fire, is to be at once rebuilt.

CAMDEN, N. J.—It is stated that a four-story addition is to be built to the woolen mill at Broadway and Jefferson St., of which Howland Croft & Son are the owners.

NEWARK, N. J.—Henry Klenn, Arch., has prepared plans for a large shoe factory, to be occupied by L. Boyder & Co., according to reports.

PHILLIPSBURG, N. J.—The erection of a large mill at this place is said to be contemplated by Ashley & Shaw, of Hackettstown. W. H. Ashley can be addressed for information.

BEAVER FALLS, PA.—The Union Drawn Steel Co. is reported about to erect an addition to its mill at this place, Funkhauser & Coates having the building contract.

COLUMBIA, PA.—The Miller Brush Co., of Shoemakerville, is reported as to remove its entire plant to this place in the near future. It is stated that new buildings will be erected, and a company organized with a capital stock of $50,000.

DU BOIS, PA.—A site is reported to have been purchased on Main and Franklin Sts. on which a new brewery will be erected. The structures will be of stone, brick and iron, and the main building will be five stories in height.

EASTON, PA.—It is reported that John T. Davies, of Jeanesville, has purchased the machine shops on East Ferry St., which he will extensively enlarge and improve.

FRANKFORD JUNCTION, PA.—Plans have been prepared for a large addition to the Slichter Cordage Works, according to reports. The structure will be of brick and steel and three stories in height.

FRANKLIN, PA.—It is proposed to form a company, with a capital stock of $100,000, for the purpose of

constructing a large plant in this city for the manufacture of the Lone Star coupler and other railway car equipments. Among those interested are C. W. Mackey, Charles Miller and J. N. Maher, formerly Supt. American Steel Casting Co., who will be manager of the new company. It is stated that the plant will be erected at once.

JOHNSTOWN, PA.—The erection of a new mill is said to be contemplated by the Cambria Iron Co.

LEBANON, PA.—It is stated that a new iron furnace is to be erected at Colebrook in the near future for the Lackawanna Iron & Steel Co.

ROYERSFORD, PA.—Press reports state that a hosiery mill is to be erected here by Fritz & Krouse.

SHARON, PA.—Press reports state that the Aschnan Steel Casting Co. will rebuild its plant, destroyed by fire two years ago. Pres., E. A. Wheeler; Treas., J. J. Spearman; Secy., W. K. Naylor.

SHIPPENSBURG, PA.—It is reported that the old Mullin paper mill at Mount Holly, which was recently destroyed by fire, is to be rebuilt and managed by a new stock company, about to be organized. Wm. C. Allison can be addressed.

BALTIMORE, MD.—It is reported that the Malleable Iron & Steel Casting Co. is to enlarge its plant at this place. Pres., P. Kennedy.

CUMBERLAND, MD.—It is reported that a hosiery mill is to be erected near this city by Henry Thompson.

WILMINGTON, DEL.—Plans have been prepared by Architect Carswell for the enlargement of the Ford Morocco Co.'s factory.

YORK, PA.—It is reported that an addition is to be built to the plant of the Weaver Organ & Piano Co. in the near future.

NORFOLK, VA.—A press report states that the Norfolk Creosoting Co. will erect a plant at Money Point.

SALTVILLE, VA.—Press reports state that a new paper mill is to be built near this place by a number of northern capitalists. George R. Sherman, of Providence, R. I., is interested.

WHEELING, W. VA.—The Wheeling Brick Co. has been organized, and it is stated that a large building will be erected.

GREENSBORO, N. C.—Two new companies have been incorporated at this place for the purpose of erecting cotton mill plants, to be known as the Revolution Cotton Mills Co. and the Prosperity Mfg. Co. They will at once erect and equip two large cotton spinning and weaving mills, to cost $200,000 each. Following are the incorporators: Revolution Mills—C. Cone, of New York; L. Banks Holt, of Burlington, N. C.; Rev. F. J. Murdock, Salisbury, N. C.; J. W. Scott and B. Frank Mebane. Prosperity Co.—J. A. Odell, Concord, N. C.; Rev. F. J. Murdock, Salisbury, N. C.; C. Cone, New York.

LUMBERTON, N. C.—A $100,000 cotton mill is to be erected at this place, and nearly all the stock has already taken by local capitalists. Pres., B. Goodwin; Secy., J. A. McAllister, Lumberton, N. C.

MAYO FALLS, N. C.—The cotton mill company which is to build a mill at this place has been incorporated with a capital stock of $300,000. F. H. Fries, Pres., of Salem, N. C., and Geo. W. Watts and B. N. Duke, of Durham, N. C., and W. Ruffin, of Rocky Mount, N. C., are the principal stockholders.

DADE CITY, FLA.—A foundry and machine shop is to be erected in this city by the Dade City Foundry & Machine Co., according to reports.

SHEFFIELD, ALA.—Press reports state that the Sheffield Coal, Iron & Steel Co. is to locate at this place.

LAFAYETTE, LA.—It is reported that a sugar mill is to be erected here by the Lafayette Sugar Mfg. Co., of New Orleans. Pres., G. A. Breaux.

HAMILTON, O.—It is reported that the Eagle Brewery Co. is about to enlarge its plant.

TOLEDO, O.—John Zynda, of Detroit, Mich., is reported as to erect a new brewery in this city, at a cost of $75,000.

GOSHEN, IND.—It is reported that a windmill factory is to be established here by S. Burbaker and E. J. Sknock.

WABASH, IND.—The Wabash Bridge & Iron Works has been organized with a capital stock of $30,000, and ground has been broken in the western part of the city for the new works. Pres., John B. Latchem; Vice-Pres., M. S. Howe; Secy. and Treas., Hiram E. Coate.

CHICAGO, ILL.—The Globe Machine Co., of this city, has been incorporated with a capital stock of $75,000 by E. N. Gage and M. A. Sherman.

CHICAGO, ILL.—It is reported that plans have been prepared by the Steel Storage & Elevator Construction Co., Connersville, Ind., for a stone and steel grain elevator to be erected for E. L. Nuschman, 308 Chamber of Commerce Bldg., at a cost of $50,000.—A four-story factory and engine house is to be erected on West 19th St. for Busse & Gleason, 56-70 La Salle St., at a cost of $75,000, after plans prepared by August Haritzen, Arch., according to reports.

MACOMB, ILL.—The Macomb Sewer Pipe Co. is reported to have decided to rebuild its plant at once on a larger scale.

APPLETON, WIS.—Plans and specifications have been prepared by Bartlett & Record, of Minneapolis, for the erection of a grain elevator for the Wisconsin Malt & Grain Co.

KAUKAUNA, WIS.—The Kaukauna Fibre Co. is said to be contemplating the equipment of its plant with steam power.

PUEBLO, COLO.—The Colorado Fuel & Iron Co. is reported as having sold $2,000,000 in bonds for extending and improving its plant and for completing the Crystal River Ry.

ELMENDORF, TEX.—A company is said to have been organized for the purpose of building a sewer pipe factory at this place, at a cost of $100,000. Aaron French, of Pittsburg, Pa., and Nelson Mackey, of this place, are among those interested.

ST. LOUIS, MO.—Plans and specifications have been prepared by E. Jungenfelder, Arch., according to reports, for a six-story brewery 99×48 ft. for the St. Louis Brewery Association, near Sidney and Ninth Sts.; estimated cost, $100,000. Pres., Ellis Wainwright.

MISCELLANEOUS CONTRACTS AND SUPPLIES.

WHARVES, ETC.—Seattle, Wash.—The Oregon Improvement Co. has had plans prepared for extensive dock improvements in this city.

FIRE ALARM TELEGRAPH.—Carbondale, Pa.—Bids are asked until Aug. 15 for a complete system of fire alarm telegraph. T. L. McMillan, Cy. Clk.

GUNBOATS.—Washington, D. C.—Bids are asked until Oct. 1 for the construction of six light-draft composite gunboats. H. A. Herbert, Secy. of Navy.

DREDGING.—New Bedford, Mass.—Bids are asked until Aug. 13 for about 6,000 cu. yds. of dredging, as stated in our advertising columns. Wm. S. Cook, Asst. Cy. Clk.

LUMBER, IRON AND PAINTS.—Washington, D. C.—Bids are asked until Aug. 7 for a supply of lumber, iron and paints. Maj. H. B. Lowry, Q. M., U. S. Marine Corps.

ELECTRIC FIRE ALARM.—St. Bernard, O.—Bids are asked until Aug. 8, according to reports, for furnishing an electric fire alarm system for this village. John C. Overman, Clk.

STEAM TUG.—New York, N. Y.—Bids are asked until Aug. 19 for the construction of a steam tug 96 ft. long, 20 ft. beam and about 8 ft. draft. Lieut. Daniel Delehanty, U. S. N., 39 Whitehall St.

STEAM ROAD ROLLER.—Lockport, N.Y.—C. J. Huston, A. B. Pruden and D. D. Sheldon have been appointed a committee by the council to ascertain upon what terms a steam road machine can be purchased by the city.

PIER REPAIRS.—New York, N. Y.—Bids are asked by the department of docks until Aug. 6 for repairing pier 43, North River. At a previous opening of bids the lowest bid was $17,985. The estimated cost of the work is $14,500.

PRISON LABOR.—Michigan City, Ind.—Bids will be received Sept. 3 for the labor of 250 convicts, more or less, for a term of not less than five years, with the privilege of renewal, from Dec. 1, 1895. Charles Harley, Warden State Prison.

CONTRACT PRICES.

REPAIRING BRICK PAVING.—Indianapolis, Ind.—The contract was let last week for the repair of Coburn St., about 2,000 sq. yds. of new brick surface on old concrete, to Indiana Paving Brick Co. at $1 a sq. yd. for patches less than 10 × 100 ft., and 75 cts. for areas more than that, and 65 cts. a sq. yd. for any concrete necessary. One other bid was $1.12 for brick surface and 75 cts. for concrete.

SEWERS.—Roselle, N. J.—The total bids received July 15 for constructing lateral sewers were given last week. The itemized bids were as follows; Ch. Engr., Carrol Ph. Bassett, Summit, N. J.:

	Quantities.		Neff & Mitchell, Newark, N.J., $11,021.	A. Costa, Orange, N. J., $8,508.	John Marsden, Utica, N. Y., $11,113.	W. H. Waters, Bayonne, N.J., $15,890.	Jas. J. Coogan, Bayonne, N.J., $11,865.
Pipe:							
12-in.	vitrified	2,600 ft.	$0.72	$0.62	$0.72	$0.95	$0.65
8-in.	vit. macdm,	5,200 "	.41	.29	.40	.65	.35
8-in.	" dirt	5,200 "	.35	.28	.35	.60	.35
8-in.	" macdm.	5,200 "	.44	.31	.45	.70	.43
8-in.	" dirt	5,200 "	.38	.30	.40	.65	.43
8-in.	" macdm.	4,800 "	.40	.35	.58	.75	.49
8-in.	" dirt	4,800 "	.35	.33	.52	.75	.49
12-in.	Y's	50	1.00	1.00	.60	.80	.63
8-in.	"	350	.50	.50	.35	.60	.34
Manholes,	to 12 ft.	300	2.25	1.75	3.00	2.50	3.50
"	over 12 ft.	100	2.25	2.00	4.00	3.00	3.50
M. H. buckets		50	2.00	1.00	1.50	1.50	1.25
Lampholes		100	1.00	1.00	.15	1.00	.50
Silt basins		5	2.00	2.00	4.00	3.00	.25
Concrete		300 cu. yds.	2.50	1.00	1.00	1.00	2.50
Iron	castings	21,750 lbs.	.01¾	.01½	.01¾	.04	.03
Iron pipe, sub. for vit. pipe			.30.00	15.00	20.00	20.00	22.50
Timber foundation			.30.00	1.00	15.00	1.00	18.00
Sheathing		10 M. ft. B.M.	30.00	1.00	1.00	5.00	.01
Excav. below grade		500 cu. yds.	.05	.05	.25	.10	.65
4-in. underdrain		500 ft.	.50	.75	.10	.30	.50
6-in.	"		.90	.80	.12	.40	.50
Manhole drops		50 ft.	1.00	1.00	.25	3.00	2.50

[1] 5 to 7 ft. cut. [2] 7 to 9 ft. cut. [3] 9 to 11 ft. cut.

BRICK, WOOD AND ASPHALT PAVING.—Saginaw, Mich.—Robt. F. Johnson, Cy Clk., writes us that the following bids were received July 20 for paving one street: 12,400 sq. yds. of brick pavement and foundation of concrete, 3,500 cu. yds. of excavation, 300 rods of tile drain, 400 ft. of Medina curbstone, six 12-in. pipe basins, seven 6-in. pipe basins, two brick sewer basins, for this work nine proposals were received, ranging from $15,587 to $21,048, the contract being awarded to the lowest bidders, Scanlan & Crowley, of Saginaw. Also bids for the following street: 7,900 sq. yds. of sapless cedar blocks on concrete foundation, 2,800 cu. yds. of excavation, 260 rods of tile drain, 300 ft. of new curbstone, 2,500 ft. of curbstone reset, 6 brick sewer basins, ten 6-in pipe basins, for this work ten proposals were received, ranging from $8,777 to $12,133 for sapless block and from $7,197 to $10,553 for common cedar, the contract being awarded to the Ross Sapless Block Co., of Saginaw, for sapless cedar at $8,777. Also bids for an asphalt contract as follows: 8,400 sq. yds. of asphalt pavement and foundation, 3,100 cu. yds. of excavation, 200 rods of tile drain, 2,200 ft. of Medina curbstone, twelve 6-in. sewer basins, the bids being as follows: T. H. Thomas, $25,547; Warren-Scharf Asphalt Paving Co., $23,508; Barber Asphalt Paving Co., $20,875; H. S. Hallwood (Wasatch asphalt), $20,151; Mexican Asphalt Paving Co., $16,700; S. H. Taylor, $16,496. The board of public works recommended to the council the awarding of the contract to H. S. Hallwood, and the matter is now under consideration by the council.

EXTENDING WATER MAINS.—Galesburg, Ill.—C. E. Wells, Supt., writes us that the contract for extending water mains was awarded to John B. McCaulay at the following prices: 16-in. pipe, $2.18 per ft.; 8-in., 76 cts.; 6-in., 62 cts. Hydrants, $22 each. 16-in. gate valves, $62 each; 8-in., $16; 6-in. $10.75. Valve boxes, $2.75. Brick pavement taken up and relaid at 20 cts. per lin. ft.

STREET CLEANING.—Buffalo, N. Y.—We have received a detailed statement of the bids received July 19 for street cleaning. The lowest bids aggregate $93,085 per year, and were as follows, the prices given being based on a single cleaning of 10,000 sq. ft.: Cooper & Hopkins, district No. 1, asphalt, 34½ cts., and stone, 49 cts.; No. 4, 30 cts. and 32 cts., respectively, for asphalt and stone; No. 6, 40 cts. and 55 cts.; No. 7, 40 cts. and 55 cts. John Martin & Co., district No. 2, 35 cts. and 50 cts.; No. 3, 26½ cts. and 45 cts. C. D. Zimmerman, district No. 8, 20 cts. and 44 cts. Nachtrieb, Beyer & Meyer, district No. 5, 27 cts. and 54 cts.

PUMPING ENGINES.—Buffalo, N. Y.—The following bids were received by the board of public works July 27 for a new 30,000,000-gallon triple expansion pumping engine:

	Price.	Time.
Lake Erie Engineering Works*..	$98,500	12 mos.
Snow Steam Pump Works.....	78,900	..
Groshon H.-D. Pump'g Eng. Co.	95,000	10 "
Henry R. Worthington	84,750	11 "
Holly Mfg. Co.	98,417	150 days.

* Completed in 5 mos., $74,500; 6 mos., $73,500; 8 mos., $71,500; 10 mos., $70,000.

The board of public works recommended to the aldermen that the contract be awarded to the Holly Mfg. Co. The aldermen, on July 29, voted, 23 to 2, in favor of giving the contract to the Lake Erie Engineering Works.

ASPHALT PAVING.—New Bedford, Mass.—Bids for laying 4,945 sq. yds. of asphalt on concrete foundation were received by W. S. Cook, Asst. Cy. Clk., on July 23, as follows: Narragansett Improvement Co., Providence, R. I., pavement, complete, maintenance guaranteed for 5 years, $4.28 per sq. yd.; maintenance for 10 years, $4.53; maintenance for 15 years, $5.03. Same without binder course, 2 ins. wearing coat, $2.98 per sq. yd.; 2½ ins. wearing coat, $3.28; 25 cts. additional per sq. yd. for each five years of maintenance guaranteed. H. Gore & Co., 54 Kilby St., Boston, Mass. Sicilian and German rock asphalt, pavement complete, 2½ ins. wearing surface; guaranteed for 5 years, $2.90 per sq. yd.; 10 years, $3.39; 15 years, $3.99.

SEWERS.—Indianapolis, Ind.—Contract was let July 23 for sewer in alley north of Buchanan St. to Mansfield & Allen, at $1.85 a lin. ft., another bid being $2.05. The sewer is 677 ft. long, consisting of 300 ft. of 18-in. pipe, 377 ft. of 15-in. pipe, 110 ft. of 6-in. house connections, 5 catchbasins, 2 manholes, 150 ft. of 15-in. laterals, 231 ft. of 12-in. laterals. Contract was also let to Fulmer-Seibert Co. for sewer in Noble and Lord Sts., at $1.82 a lin. ft., other bids being $1.87 and $2.34. The sewer is 1,150 ft. long and has 780 ft. of 18-in. pipe, 370 ft. of 12-in. pipe, 540 ft. of 6-in. house connections, 6 catchbasins, and 3 manholes.

CAST IRON PIPE.—Grand Rapids, Mich.—A contract for 8,100 ft. of 12-in. and about 1,500 ft. of 10-in. cast iron water pipe, has been awarded to the Addyston Pipe & Steel Co., at $21.40 a ton; special castings, 2¼ cts. a lb.

CEMENT.—Minneapolis, Minn.—The Northwestern Cement Co. has been awarded the contract for furnishing the cement to be used in the sewer work during the year 1895. The bid was $2.65 per bbl. for Empire American Portland, with an allowance of 5 cts. for the empty barrel, thus bringing the cost down to $2.60.

BRICK.—Minneapolis, Minn.—A contract for 90,000 brick for the new reservoir has been awarded to John A. Berg, at $6.43 per M. It is stated that three times this amount will be required, but that this was the only bid received.

CAST IRON PIPE.—Warsaw, N. Y.—The contract for pipe for the new water-works, as advertised in Engineering News, has been awarded to F. B. Hawkins & Co., New York, agents for the South Pittsburg Foundry Co., South Pittsburg, Tenn., at $20.15 a ton for 4-in. pipe, and $19.15 for all other sizes.

CEDAR BLOCK PAVING AND OAK LUMBER.—Detroit, Mich.—The "Tribune" states as follows: The board of public works received bids July 19 on $30,000 worth of paving contracts and on a small lumber contract, the lowest bidders being as follows: Paving.—Mt. Elliott Ave., cedar blocks on concrete foundation, widening the roadway 5 ft. on each side, James Grant, $7,225, or $1.03 per sq. yd.; Forest Ave., from Beaubien to St. Aubin, cedar on concrete, Talbot Paving Co., $17,023, or 97 cts. per sq. yd.; Forest Ave., from west line of the Brush farm to Beaubein St., cedar on concrete, Talbot Paving Co., $2,581, or 97 cts. per sq. yd.; Henry St., from Third to Cass Ave., cedar on concrete, 30 ft. wide, Talbot Paving Co., $3,797, or 97 cts. per sq. yd. This is the lowest price the city ever received for paving with cedar blocks on concrete foundation. Two years ago the board of public works was highly gratified on getting a bid of $1.10 a sq. yd. Last year the price was reduced to $1.04 a sq. yd. and this year the lowest point is 97 cts. per sq. yd. Oak lumber for Belle Isle bridge.—F. W. May, $24 per M. ft., and the Kirk Christy Co., $19.90 per M. ft.

ASPHALT AND WOOD PAVING.—Indianapolis, Ind.—Contracts were let July 18 and 20 for the following: Asphalt on East St., to the Western Paving & Supply Co., at $4.57 a lin. ft. of each side of the street, 3,328×26 ft., the work consisting of 10,048 sq. yds. of asphalt on 6 ins. Portland cement concrete, 2,635 sq. yds. of broken stone under street car track, 6 ins. deep, 6,138 ft. of stratified limestone curb, 378 ft. of granite round corners, 434 ft. of marginal stone and 26 inlets. The Warren-Scharf Asphalt Paving Co. bid $4.85, and the Indiana Bermudez Co., $4.70. Asphalt on Morris St., 97×24 ft., to the Western Paving & Supply Co., at $5.30 a lin. ft. of each side. Asphalt on Meridian St., 575×50 ft., to the Western Paving & Supply Co., at $7.85 a lin. ft. of each side of the street, the work consisting of 3,599 sq. yds. of asphalt on 6 ins. Portland cement concrete, 991 ft. of curb, 113 ft. of round corners, Parkhurst curb, 225 ft. of marginal stone and four inlets. The Warren-Scharf Co. bid $8.50 and the Indiana Bermudez Co., $8.58. Washington red cedar pavement on Meridian St. from Vermont to St. Clair, 1,900×50 ft., to the Fulmer-Seibert Co., at $7.73 a lin. ft. of each side of the street, with Parkhurst curb. The work is 11,200 sq. yds. of block surface on 6 ins. Portland cement concrete, 3,909 ft. of curb, 341 ft. of marginal stone, 2 catchbasins, 14 inlets. Other bids were: Capitol Paving & Construction Co., $8.55 to $9.12 on various samples of Washington cedar and $9.98 on sample of California redwood; Indiana Paving Brick Co., $8.35; Talbot Paving Co., $8.35; Western Paving & Supply Co., on California redwood, $8; Browder & Shover, $7.68 to $8.20, and Fulmer-Seibert Co., $7.73 to $8.11 on Washington cedar and $8.57 on California redwood. Washington red cedar pavement on Meridian St. from St. Clair to Seventh

St., 3,734 × 36 ft., to Browder & Shover, at $5.60, with Parkhurst curb. The work is 15,004 sq. yds. of block on 6 ins. Portland cement concrete, 7,080 ft. of curb, 326 ft. marginal stone, 44 inlets. Other bids were: Capitol Paving & Construction Co., $5.97 to $6.30 on samples of Washington cedar and $7.99 on California redwood; Talbott Paving Co., $6.10; Indiana Paving Brick Co., $6.04; Western Paving & Supply Co., on California redwood, $5.90; Fulmer-Seibert Co., $5.68 to $5.95 on Washington cedar and $6.40 on California redwood, and Browder & Shover, $5.43 to $5.80. Chas. C. Brown, Cy. Engr.

METAL MARKET PRICES.

LEAD.—New York: 3.32 to 3.55 cts. Chicago: 3.1 to 3.3 cts. St. Louis: 3.32 to 3.37 cts.

BARB WIRE.—Pittsburg: $2.10 for galvanized and $1.40 and $1.50 for plain in carloads and less than carload lots at mill.

FOUNDRY AND PIG IRON.—New York: $12 to $14. Pittsburg: $11.50 to $14.50. Chicago: $12 to $14.

TRACK MATERIAL.—New York: angle bars, 1.4 to 1.45 cts.; spikes, 1.8 to 1.85 cts.; track bolts, 2 to 2.2 cts. with square, and 2.1 to 2.2 cts. with hexagon nuts. Chicago: angle bars, 1.45 to 1.55 cts.; spikes, 1.8 to 1.9 cts.; track bolts, 2 to 2.05 cts. with square, and 2 to 2.15 cts. with hexagon nuts.

NAILS.—Pittsburg: $2.05 per keg for carload lots and $2.15 for less than carload lots, for wire nails at mill; $1.80 and $1.85 for cut nails at mill. Chicago: $2.20 and $2.30 for wire nails, $2 and $2.05 for cut nails. New York: $2.20 and $2.30 for wire nails, and $1.95 and $2.05 for cut nails.

RAILS.—New York: $24 at eastern mills and $24.75 at tidewater; old rails, $13.50 to $14 for iron, and $11.50 to $12 for steel; light rails, $24; girder rails, $26. Pittsburg: $22 for standard sections of 45 lbs. and over; $23 for light sections; old rails, $15 to $15.50 for iron and $13 to $14 for steel. Chicago: $25 to $27 for standard sections; $25 for light sections; old rails, $16 to $16.50 for iron and $11.50 to $12 for steel.

STRUCTURAL MATERIAL.—New York: beams, 1.65 to 2.1 cts.; channels, 1.65 to 1.75 cts.; angles, 1.5 to 1.6 cts.; tees, 1.8 to 1.9 cts; universal mill plates, 1.75 to 1.8 cts.; steel plates, 1.75 to 1.9 cts. for tank, 1.8 to 1.95 cts. for shell, 1.95 to 2.05 cts. for flange, 2.1 to 2.25 cts. for ordinary firebox, 2.25 cts. for locomotive firebox. Pittsburg: beams, 1.5 to 2 cts.; channels, 1.5 to 2 cts.; angles, 1.4 to 1.45 cts.; tees, 1.5 to 1.6 cts.; Z-bars, 1.55 to 1.65 cts.; universal mill plates, 1.6 to 1.7 cts.; steel plates, 1.6 to 1.8 cts. for tank, 1.7 to 1.9 cts. for shell, 1.8 to 2 cts. for flange, 2 cts. for ordinary firebox, and 2 to 4 cts. for locomotive firebox. Chicago: beams, 1.7 to 1.8 cts.; channels, 1.7 to 1.8 cts.; angles, 1.6 to 1.7 cts.; tees, 1.75 to 1.85 cts.; universal plates, 1.85 to 1.95 cts.; steel plates, 1.75 to 1.85 cts. for tank, 2.1 to 2.25 cts. for flange, 2.5 to 2.75 cts. for ordinary firebox, and 4.5 to 4.75 for locomotive firebox.

INDUSTRIAL NOTES.

WILLIAM LITTLE, of Swedeland, Pa., has started a paving brick factory.

THE PAGE WOVEN WIRE FENCE CO., of Adrian, Mich., has an order from the Wilmington & Northern R. R.

THE RANSOME SUBWAY CO., of Chicago, Ill., has the contract for a conduit for water-works at St. Paul, Minn.

THE DEXTER SPRING WORKS, Oakmont, Pa., will be sold at sheriff's sale Aug. 5. Samuel Lewis, receiver.

THE OHIO FALLS CAR MFG. CO., of Jeffersonville, Ind., has an order for 300 box cars for the Pennsylvania R. R.

THE MUSCATINE TERRA COTTA LUMBER CO., of Muscatine, Ia., will sell its brick and tile works at auction Aug. 22.

RITER & CONLEY, of Pittsburg, Pa., have completed a large iron-hulled river dredge for the government engineer service.

THE ROXBURY GRANITE CO., of Keene, N. H., has the contract for stone work for a new reservoir at New Bedford, Mass.

THE JOHN GRANT PAVING CO., of Omaha, Neb., had its asphalt plant destroyed by fire recently, involving a loss of about $5,000.

THE ROGERS LOCOMOTIVE CO., of Paterson, N. J., has an order for six ten-wheel engines for the Jamaica Ry., West Indies.

FORD & DONNELLY, of Kokomo, Ind., are enlarging their plant on account of the increasing demand for machinery for tin plate works.

THE MACOMB SEWER PIPE CO., of Macomb, Ill., whose plant was burned recently, will rebuild its plant on a larger scale. Director, J. M. Keefer.

THE AMERICAN WIRE NAIL CO., of Anderson, Ind., has put its works in operation, and has a capacity of 2,000 kegs per day, besides wire rods.

THE NATIONAL RAILWAY FOOT GUARD CO., of Columbus, O., has an order for foot guards for frogs from the Cincinnati, New Orleans & Texas Pacific Ry.

W. B. SCAIFE & SONS, of Pittsburg, Pa., are building several steel buildings with corrugated iron sheathing and roofing for the Canonsburg Iron & Steel Co., of Canonsburg, Pa.

THE ST. CHARLES CAR CO., of St. Charles, Mo., is building 200 box cars of the class X Y type for the Pennsylvania R. R. The cars will be completed for the autumn traffic.

THE McCONNELL WATER FILTER CO., of Buffalo, N. Y., has had an application made for dissolution, and Charles F. Warner has been appointed temporary receiver.

THE NATIONAL TIN PLATE WORKS, of Anderson, Ind., has started up four mills with a force of 200 men, and will start up the other mills and the tinning department in August.

THE LONE STAR CAR COUPLING WORKS will erect a plant at Franklin, Pa., for the manufacture of car couplers and railway appliances. C. W. Mackey and W. H. Forbes are interested.

THE DICKSON MFG. CO., of Scranton, Pa., is building for the Delaware & Hudson R. R. three passenger engines with cylinders 19 × 24 ins., driving wheels 68 ins. diameter, and weighing 120,000 lbs.

THE RIVERSIDE IRON WORKS, of Benwood, W. Va., expects to blow in the Riverside furnace on Sept. 1. Bessemer pig iron will be manufactured, for which the furnace has an annual capacity of 70,000 tons.

THE HUYETT & SMITH MFG. CO., of Detroit, Mich., is building the direct-driven fans and fan engines for the Howden hot forced draft system on two new steamers being built by the Detroit Dry Dock Co.

THE VANDERBILT STEEL & IRON CO., of Birmingham, Ala., expects to blow in its Clara furnace during the autumn. The furnace manufactures coke pig iron, and has an annual capacity of 22,500 gross tons.

THE BEE-HIVE COKE OVEN BY-PRODUCTS CO., of Trenton, N. J., has been organized with a capital stock of $500,000. Warren Delano, Vice-President of the Lackawanna Iron & Steel Co., Scranton, Pa., is interested.

THE PITTSBURG IRON & STEEL CO., of Pittsburg, Pa., is reported to have acquired the Moorhead & McLean Steel Works, which have been shut down for two years, and to intend purchasing the Keystone Rolling Mill.

THE SCHENECTADY LOCOMOTIVE WORKS, of Schenectady, N. Y., has delivered to the Fitchburg R. R. a ten-wheel express engine, with cylinders 20 × 24 ins., driving wheels 6 ft. 1 in. diameter, and weighing 122,000 lbs.

THE CITICO FURNACE CO., of Chattanooga, Tenn., expects to blow in its furnace about Aug. 1, and the furnace is now being overhauled and repaired. It manufactures coke pig iron, and has an annual capacity of 36,000 tons.

THE Q. & C. CO., of Chicago, Ill., states that since November last over 1,000,000 of the Servis tie-plates have been ordered by the Southern Pacific Ry. The plates used on the Pacific system of that road are laid almost exclusively on redwood ties.

THE DAYTON MALLEABLE IRON CO., of Dayton, O., has issued a circular stating that its men have declared their recent strike off, and have returned to work. It states that this is the only occurrence of the sort during the company's 20 years of business.

THE FINISHED STEEL CO., of Youngstown, O., is building its plant for the manufacture of cold rolled shafting in the suburb of Haselton. The main building is 224 × 62 ft., with a wing 70 × 20 ft. Pres. and Gen. Man., C. Seymour Dalton; Secy., T. E. Davey.

THE AETNA STANDARD IRON & STEEL CO., of Martin's Ferry, O., is running its sheet and tin-plate mills on three turns a day, and reports orders in excess of the present capacity. About 1,800 men are employed, and a 10% increase in wages has been made.

THE DETROIT DRY DOCK CO., of Detroit, Mich., is building a large passenger steamer for the Cleveland & Buffalo Line, and two steamers for the New York and New London service, the latter vessels being built for the company at the Roach shipyards at Chester, Pa.

ALFRED FIELD & CO., New York, are introducing a new patent rapid jack, which can be used for lifting, pushing and hauling. It has two heads, connected by a right and left-handed screw, which can be operated by bars or by a ratchet handle. The heads are grooved so as to be fitted for lifting and bending shafting.

THE NORDYKE & MARMON CO., 91 Morris St., Indianapolis, Ind., is introducing the Lambert gas and gasoline engine. It is of the horizontal, single acting type, of simple construction, and has the flow of gas regulated by an automatic governor. The charge is exploded by means of a small electric battery.

THE AURORA BOILER WORKS, Aurora, Ill., has recently been awarded the contract for furnishing four 60-in. × 16-in. Otis steel boilers to the Elgin Insane Asylum. There is considerable activity in the boiler department, and the firm is also building a water-works stand-pipe for Maywood, Ill., to be 16 ft. diameter and 100 ft. high.

CORRIGAN, McKINNEY & CO., of Cleveland, O., on July 16 started up the Charlotte furnace at Scottdale, Pa., which has been idle since 1890. The furnace is owned by the National Foundry & Pipe Works, of Scottdale, and is operated by Corrigan, McKinney & Co. under lease. Coke pig iron is being made. The annual capacity is 60,000 tons.

EDWARD A. OSSE, of Baltimore, Md., is introducing a fountain sensitizing brush or sweep for use with the blueprint, white print, and other heliographic processes. A chamber in the horizontal handle holds a charge of the liquid, and the amount discharged may be increased or any surplus drawn up by pressing or relaxing the pressure on the handle.

THE FISHER MACHINE WORKS, Pittsburg, Pa., will be sold at auction at the court house, Pittsburg, on Aug. 7. The property comprises a lot 100 × 264 ft., with an iron building containing engine, boiler, cranes, cupolas, fan, machine tools and the appurtenances of a foundry and machine works. A. Leggatt & Son, auctioneers, 212 Fourth Ave., Pittsburg, Pa.

RYAN & McDONALD, contractors, of Baltimore, Md., have dissolved partnership, and both Cornelius J. Ryan and John B. McDonald will continue in business independently. The firm was mainly engaged in railway construction, having built several lines in this country and Mexico, its latest work being the Baltimore Belt tunnel.

THE FALLS RIVET & MACHINE CO., of Cuyahoga Falls, O., has the contract for the power transmitting machinery for the Diamond Match Co.'s large match factory at Liverpool, England. The order consists of shafting, ring oiling bearings, friction clutches, steel rim pulleys, gears, etc. The company has similarly fitted up several factories in this country for the Diamond Match Company.

THE RICHMOND LOCOMOTIVE WORKS, of Richmond, Va., has been making trials of one of its two-cylinder compound engines on the Chicago, Rock Island & Pacific Ry. The engine is of the ten-wheel type, with cylinders 19 × 24 and 30 × 24 ins., 62-in. driving wheels, and weighing 143,000 lbs., with 115,000 lbs. on the driving wheels. The engine can only be worked simple when the reversing lever is in the end notch.

THE PORTSMOUTH PAVING BRICK CO., of Portsmouth, O., which is operating the old Black Diamond plant, has received large orders for paving material from New Orleans, and as the local works will not be able to fill the demand, the yards at Indian Run have been pressed into service. The Kentucky Fire Brick Works, which is the fire brick department of the same company, is running double time and making extensive shipments.

THE BATH IRON WORKS, of Bath, Me., has the contract for a lightship of composite construction, with steel frames and plank sheathing. It will be 112 ft. long, 28.6 ft. beam and 13 ft. draft, with a freeboard of about 20 ft. There will be two pole masts, carrying electric flash lights. An engine and screw are provided, so that the strain on the anchor chains can be relieved in heavy weather, and so that the vessel can return to her anchorage if shifted by a storm.

R. W. HILDRETH & CO., engineers, 50 Broadway, New York city, have been engaged to inspect the material for the Cooper-Siegel Building on 18th St. and Sixth Ave., New York city, and also to inspect the reconstruction of the Old Colony pier shed, which was blown down recently. The steel frame of this shed is very badly twisted and broken from the accident, and in its reconstruction it is an important matter to see that only undamaged material is used for rebuilding it.

THE PITTSBURG BRIDGE CO., Pittsburg, Pa., has the contract for two through plate girder spans for the Pittsburg, Shenango & Lake Erie Ry., and is also building a bridge of two fixed spans of 350 ft., and a draw span of 440 ft., designed by J. A. L. Waddell. It has also the contract for the bridges on the extension of the Kansas City, Pittsburg & Gulf R. R., including 9 spans of 50-ft. deck girders, 2 spans of 70-ft. girders, 2 pin-connected spans of 100 ft. and 2 of 200 ft.

THE SHIFFLER BRIDGE CO., of Pittsburg, Pa., has built a plate girder bridge 122 ft. long to cross the Philadelphia & Reading R. R. at Sixth St. and Allegheny Ave., in Philadelphia. The girders are 10 ft. deep. They were transported on two special cars, supporting the ends, with three ordinary flat cars between them. The company has also the contract for the building of the new works of the Apollo Iron & Steel Co., at Vandergrift, Pa. The main buildings will be 53 × 1,120 ft., 60 × 800 and 80 × 800 ft.

THE BUCYRUS BRICK & TERRA COTTA WORKS, of Bucyrus, O., has been ordered sold. The works were extensively equipped for the manufacture of paving brick and terra cotta, but the clay had to be imported from Athens county, and the cost of the raw material was so great that it was impossible to place the product upon the market at a price which would allow competition with outside firms. All the paving brick for eight miles of streets in Bucyrus was manufactured by this concern, but, as no paving is being done there at present, it is thought advisable to sell the works.

THE LINK BELT MACHINERY CO., of Chicago, Ill., reports a general improvement in the demand for goods in its line. It is equipping the factory of the Monarch Bicycle Co, with new machinery throughout, and is building a locomotive coaling plant for the Northern Pacific R. R. at Tacoma, Wash. This plant will consist of two conveyors 200 ft. long, the conveyors having a series of overlapping steel pans, 48 ins. wide; each conveyor will have a capacity of 400 tons per hour. The company has equipped the Metropolitan Elevated R. R., Chicago, with ash and coal handling machinery throughout, and is to equip the three new boiler houses of the American Sugar Refining Co., New Orleans, La., with the same kind of machinery. In the boiler department, A. W. C. Ward, Supt., there is being erected a 4,000 HP. plant for the North Chicago St. Ry. Co., and the following orders are on hand: Independence, Ia., electric lighting plant, 250 HP.; Western Electric Co., Chicago, 600 HP., including coal and ash handling machinery; 750 HP. for new Mabley Building, Detroit; 250 HP., Globe Soap Co., Cincinnati; 100 HP. for Keystone Woven Wire Fence Co.'s new plant at Peoria, Ill.

NEW COMPANIES.—Hamilton Irrigation Co., Los Angeles, Cal.; $1,000,000; W. S. Montgomery, of Los Angeles; M. D. Hamilton and Joseph Beilis, of San Diego.

Marble Falls Granite Co., Marble Falls, Tex.; $60,000; John H. Barrett and others.

Basic Brick Co., Pittsburg, Pa.; $25,000, with $2,500 paid in; Treas., Wm. A. Stanton.

Alva Hubbard Heating Co., Baltimore, Md.; $5,000; Alva Hubbard and W. S. Pevilley.

Woodside Mfg. Co., Oxford, Pa.; $10,000, with $1,000 paid in; machinery; Robert G. Woodside.

Mount Carmel Iron Co., Mount Carmel, Pa.; $20,000, with $2,000 paid in; Treas., James M. Derby.

Birdsboro Gas Light & Fuel Co., Birdsboro, Pa.; $1,000; Treas., Paul W. Smith, Philadelphia.

The Bexar Irrigation & Canal Co., San Antonio, Tex.; $18,000; Edward Truehart and C. K. Crawford.

Shelby County Telephone Co., Shelbina, Mo.; $6,000, all paid in; James M. McCully and D. L. Stewart.

United States Nut Lock Co., Pittsburg, Pa.; $5,000; James B. Phillips, Edwin W. Smith and J. J. Miller.

Latrobe Telephone Exchange Co., Latrobe, Pa.; $5,000, with $500 paid in; Treas., Charles J. Donnelly.

Albright White Lead Co., Newark, N. J.; $100,000; Andrew Albright, Thomas Benfield and John W. Coghlan.

North American Mining & Milling Co., Cleveland, O.; $1,000,000, with $1,205 paid in; C. C. Hill, A. C. Bates and T. M. Irvine.

Leechburg Bridge Co., Leechburg, Pa.; $20,000; Andrew Gunder, Allegheny, Pa.; Frank J. Beale and George Kulpshield.

VALUABLE ITEMS.

Much of the very best information published in our Construction News comes to us from subscribers who send items in reference to work with which they are connected or in which they are interested. Such reliable items are not only greatly desired by us but frequently result in much good to the sender by bringing his name and his work to public attention. If you are not already doing so we ask you, hereafter, to send us the earliest possible information of work that comes under your notice.